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ASSESSMENT OF THE SAVANNA ARICULTURAL RESEARCH INSTITUTE (SARI) NYANKPALA, NORTHERN REGION, GHANA

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ASSESSMENT OF THE SAVANNA ARICULTURAL RESEARCH INSTITUTE (SARI) NYANKPALA, NORTHERN REGION, GHANA

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ACRONYMS

AEAs	Agricultural Extension Agents
AGRA	Alliance for Green Revolution in Africa
ARI	Animal Research Institute
AVCMP	Agricultural Value Chain Mentorship Project
CoE	Center of Excellence
CMM	Capability Maturity Model
CORAF/WECARD	West and Central Africa Council for Agricultural Research and Development
CPWF	Challenge Program on Water and Food
CRI	Crops Research Institute
CRSP	PEANUT Collaborative Research Support Program
CSIR	Council for Scientific and Industrial Research
DTMA	Drought Tolerant Maize for Africa
EMBRAPA	Brazilian Agricultural Research Corporation
ERI	Emergency Rice Initiative
EU	European Union
FABS	Food and Budgetary Support
FBO	Farmer Based Organization
GAABIC	Ghana Agricultural Association and Business Information Center
GCP	Generation Challenge Program
GCRI	Ghana Cocoa Research Institute
GCDT	Global Crop Diversity Trust
HRD	Human Resource Development
ICT	Information and Communication Technology
ICRISAT	International Crops Research Institute for Semi Arid Tropics
IFAD	International Fund for Agricultural Development
IFDC QUEFTTS	International Fertilizer Development Center QUEFTS
IITA	International Institute for Tropical Agriculture

INTSORMIL	International Sorghum and Millet
IPA	Innovations for Poverty Action
IRRI	International Rice Research Institute
JIRCAS	Japan International Research Center for Agricultural Sciences
KNUST	Kwame Nkrumah University of Science and Technology
MEST	Ministry of Environment, Science and Technology
MIS	Management Information System
MoFA	Ministry of Food and Agriculture
MoU	Memorandum of Understanding
N2 Africa	Nitrogen Africa
NGO	Non-Governmental Organization
PROMISO	Promoting Millet and Sorghum Production
PTD	Participatory Technology Development
PVO	Private Voluntary Organization
RELC	Research Extension Linkages Committee
R&D	Research and Development
RSSP	Rice Sector Support Program
RTIMP	Root and Tuber Improvement and Marketing Program
SHP	Soil Heal Project
SME	Small and Medium Enterprises
S&T	Science and Technology
SSNIT	Social Security and National Insurance Trust
TL 2 Groundnuts	Tropical Legumes Groundnuts
TLs Cowpea	Tropical Legumes Cowpeas
WAAP	West Africa Agricultural Project
SARI	Savanna Agricultural Research Institute
UDS	University for Development Studies
USAID	United States Agency for International Development
YIIFSWA	Yam Improvement for Income and Food Security in West Africa

EXECUTIVE SUMMARY

The Savanna Agricultural Research Institute (SARI) is a research institution established in the northern region of Ghana with a mandate to conduct research into food and fiber crop farming for the purpose of introducing improved technologies to enhance agricultural production and productivity.

In order for USAID/Ghana to understand the institutional capacity and needs of SARI, it requested technical assistance from Africa Lead to conduct an institutional assessment of the organization. The Africa Lead consultants served as facilitators to guide SARI staff and other identified key stakeholders as they analyzed the organization and determined which development stage best describes the institute's current state. The team used a Participatory Capacity Assessment framework to build consensus around SARI's current state and around desired areas for transformation. The assessment covered a range of issues of organizational development and benefited from the triangulation of diverse voices and opinions within and outside the organization.

Two previous assessments of SARI preceded this exercise. SARI commissioned the first one in 2005, and a USAID in-house team conducted the second one in April 2012. Some of the findings of the first assessment include the following: poor and inadequate accommodation and research infrastructure, inadequate state-of-the-art equipment, limited commercialization activities to generate funds and poor reward and incentive-packages for staff. The second rapid assessment conducted by USAID, the team, concluded that although SARI has been successful in cooperating and collaborating with international agricultural research centers and also attracting funding from development partners, foreign universities and other local programs, the institute and its outstations are currently facing serious challenges relating to infrastructure, research equipment and supplies, logistics, internet connectivity as well as, an absence of ICT facilities leading to poor dissemination of key information. The report also highlighted the need for additional breeders to serve as replacements for those due to retire and for filling vacant research positions for some selected crops.

The challenges identified in this present assessment are to a large extent, similar to those identified in the two assessments cited above. The needs of the institute remain the same today. SARI will require a great deal of technical and financial assistance to transform itself into a leader in technology generation and dissemination in the Northern regions of Ghana.

The major outcomes of the present assessment follow below:

1) SARI has managed to carry out some of the provisions of its strategic plan through the implementation of an operational plan from 2005 to date. A review of the targets set in the 2005 assessment and the achievement to date (2012) proved difficult since there was no reference point from which to verify progress being made and there was no consolidated indicator tracking table to show the progress so far.

2) Scores for the stages of development of SARI were as follows: governance (2.6), management practices (2.7), human resources (2.8), service delivery (2.7), external relations (2.3), sustainability (2.7), financial management (4), financial vulnerability (4) and financial viability (2). The average score obtained is 2.9 and shows that SARI is at the emerging stage of organizational development and has several organizational development needs that must be met to strengthen its capacity to perform at a mature level

3) Several problems related to staff training, accommodation and research infrastructure, state-of-the-art equipment and facilities, commercialization of activities and incentive packages for staff, encroachment on land and others that had been identified in earlier assessments still plague the institute and affect the level of performance of the institute to deliver on its mission. There are several opportunities for assisting SARI to overcome these limitations and these are detailed in the recommendations.

This report includes a summary of 19 issues with recommendations regarding governance, management, human resources, infrastructure, service delivery, external relations, sustainability, financial management, financial vulnerability and financial viability and other issues discussed.

One of the major issues for immediate consideration relates to SARI's funding. The Government of Ghana (GoG) is the largest funder of SARI (over 53%) but about 86% of the funds provided go into research costs and materials and little remains to fund infrastructure, equipment and farmer-generated research. To address the funding issue, the following 4 major recommendations (in order of priority) have been made to SARI and the GoG:

- The board of SARI should develop a strategy for engaging the government to negotiate for a portion of the 10% national budget earmarked for the implementation of the CAADP program to SARI through CSIR. The level of funding needs to be negotiated with the GoG by the SARI board, CSIR and the Ministry of Environment, Science and Technology
- The well established formal mechanisms for collaborating with government, donors and other organizations and, also SARI's privilege of providing input into policy-making issues in its area of expertise offer opportunities that it can use to lobby for more funds from GoG and other donors. SARI must take advantage of its existing strong partnership with GoG to obtain more research funds to enable it to respond to the research priorities specified by its stakeholders.
- SARI should strengthen its communication processes to make it more visible to the wider public, private and civil society sectors and to empower the institute to market itself adequately through the provision of capacity development assistance in the areas of advocacy, establishment of a website and a public relations/media unit and establishment of a media strategy to assure constant interactions and advertisement of SARI's activities. SARI should also develop a strategy for promoting and marketing its services and products which would also open up more opportunities to serve the interests of its many stakeholders in addition to the contracts it is able to negotiate with the large external donors.

Other key capacity building needs of SARI that have been identified for consideration by CSIR-SARI, Government, USAID and other development partners are outlined below:

1. Governance of SARI (*1.1 Board of Directors, 1.2 Leadership, 1.3 Constituency*).
2. Management Practices (*2.1 Planning, 2.2 Program Development and Implementation, 2.3 Administrative Procedures, 2.4 Streamlining of Research Contracts).*
3. Human Resource Management (*3.1 Human Resource Development).*
4. Service Delivery (*4.1 Impact assessment).*
5. External Relations (*5.1 Inter-Organization Collaboration, 5.2 Public and Media Relations)*
6. Sustainability (*6.1 Development of Commercialization Strategies).*
7. Funding of Farmer-Client-Driven Research.

8. Re-Orientation of SARI to Support Private Sector-Driven Research and Technology Generation.
9. Scaling-Up of Successful Projects in Technology Generation and Dissemination.
10. Introduction of Biotechnology, Climate Change, Nutrition and ICT Units in SARI's Research and Development Programs.
11. Funding for Development of Infrastructure and other Research Facilities.
12. Establishment of a Center of Excellence at SARI

RECOMMENDATIONS FOR CONSIDERATION BY USAID

Among the various recommendations that have been made above, a number of them that require immediate attention have been prioritized and listed below for consideration by USAID. These recommendations include the following:

a. Capacity building training to improve governance of SARI (recommendations 1.1 - 1.3).

b. Capacity building training to improve management practices of SARI (recommendations 2.1 & 2.3).

c. Support for SARI's staff capacity development plan (recommendation 3.1).

d. Capacity building to increase service delivery of SARI (recommendation 4.1).

e. Capacity strengthening for development of commercialization strategies to ensure sustainability (recommendation 6.1).

f. Introduction of Biotechnology, climate change, nutrition and ICT units in SARI's research and development programs (recommendation 10).

g. Funding for development of critical infrastructure and facilities required for the conduct of first-class research by SARI scientists (recommendation 11).

h. Establishment of a Center of Excellence at SAR I (recommendation 12).

I. INTRODUCTION

The Savanna Agricultural Research Institute (SARI) is a research institution established in the northern region of Ghana as a campus-based research institute with a mandate to conduct research into food and fiber crop farming for the purpose of introducing improved technologies to enhance agricultural production and productivity in the northern regions of the country. The institute is located in Nyankpala, near Tamale but operates stations in each of the northern regions, namely, Northern, Upper East and Upper West. It also operates several substations in each of the regions where research is conducted to represent the various agro ecological, climatic, socio-cultural and soil conditions.

SARI operates a model organized around Farming Systems Research Groups (FSRG) in each of the three regions with core scientists in Agronomy, Soil science, Crop protection, Socio-economics and a Scientific Support Group (SSG) that backstops the farming systems groups. Each station is expected to have scientists covering agronomy, entomology, post-harvest, socio-economic, plant breeding, plant pathology, horticulture and soil science.

The major research activities of the institute, which are conducted on-station and on-farm, are in the areas of five core research programs, namely:

- Crop Improvement
- Soil Fertility
- Cropping Systems
- Crop Protection
- Post Harvest

Socio-economic research underpins all the core research programs. The mandated crops are maize, sorghum, cowpea, groundnuts, bambara-groundnuts, pigeon peas, soybean, cassava, yam, sweet potato, frafra potatoes, rice, millet, vegetables, cotton and tree crops. The institute is endowed with skilled human capital and good leadership and has demonstrated its flexibility by adjusting its policies and portfolios of research activities in the light of changing conditions and emerging new opportunities to acquire knowledge and technologies from abroad. SARI has developed several technologies through its research efforts aimed at finding solutions to the many constraints facing agricultural production in the northern regions, however, the capacity to respond to the present and emerging challenges is often limited. SARI conducted a self-assessment in 2005 in an attempt to assess its capacities to provide the basis for charting a new direction that can make it more relevant, opportunistic and responsive to the needs of its core clients. The assessment revealed the capacities of SARI, as well as, the various challenges that impact on its expected effectiveness as a national research institution mandated to work on agricultural research problems in the northern regions of Ghana. The results of that assessment formed the basis for making choices regarding the institute's future strategy that was articulated in the new 10-year strategic plan and a 3-year operational plan.

In spite of the successful achievements of the institute, several problems related to accommodation and research infrastructure, state-of-the-art equipment and facilities, commercialization of activities, staffing, incentive packages for staff, encroachment on land, among others, remain daunting. USAID, as part of its focus on agricultural development in the northern regions, is interested in getting a better understanding

of the various challenges that SARI is facing in delivering on its mandate as a major research institution in the north. Furthermore, the Mission is interested in knowing the type of assistance that is required to assist the organization to better meet the research and development needs of its core-clients, the rural farmers and other private sector participants in the agricultural industry. The purpose of this assessment of SARI is to provide an understanding of SARI's capacity and level of organizational effectiveness in meeting its mandate as a premier research institution serving the agricultural community in the Northern regions of Ghana. The Scope of Work is found in Appendix 1.

II. THE ASSESSMENT PROCESS AND METHODOLOGY

A simple framework was employed to examine the "fit" among SARI's Mission, the needs of the constituents and stakeholders it seeks to serve and its capacities in relation to technical, organizational, financial and infrastructural support systems that would ensure the fulfillment of its mandate. This meant that the Team had to confirm and examine the mission of SARI as well as visit the various stakeholders it seeks to serve and to do a detailed capacity assessment of the institution in order to determine its current situation with respect to the mandate that it has been given by the Government of Ghana.

A Participatory Capacity Assessment framework, comprised of a practical tool and theoretical framework, was employed to evaluate nine (9) areas of organizational development, namely:

1. Governance (mission, constituency, leadership, legal status)
2. Management practices (organizational structure, information systems, administrative procedures, personnel procedures, planning, program development, M&E, program reporting)
3. Human resource management (human resource development, staff roles, work organization, diversity/representation issues, supervisory practices)
4. Service delivery (sectoral expertise, constituency ownership, impact assessment)
5. External relations (constituency relations, inter-association collaboration, government collaboration, donor collaboration, public relations, local resources – private sector and other local resources, media)
6. Sustainability (program benefit sustainability, organizational sustainability, financial sustainability, resource sustainability)
7. Financial resources management (audit, accounting system and financial reports, cash/petty cash management, bank management, cash advance management, procurement management, non-expendable equipment/fixed assets management, information technology, sub-contracts).
8. Financial vulnerability; and
9. Financial viability/adequacy

There was an initial consultative meeting with SARI's senior management to agree on the methodology and to focus on the nine competency areas listed above. The main goals of the participatory capacity assessment are to support SARI in the following:

- Identifying the key capacity gaps of the organization
- Understanding its relationships with the various stakeholders
- Promoting deeper staff understanding of and commitment to the organization
- Analyzing and developing its internal management and operation systems and infrastructure and
- Providing adequate information on the institute's capacities to enable it receive possible assistance from USAID Ghana.

The two consultants Dr. Kwesi Opoku-Debrah and Dr John Nene-Osom Azu, contracted by USAID/Africa Lead, served as facilitators to guide SARI staff and other identified key stakeholders as they analyzed the organization and determined which development stage best describes the institute's current state. This participatory process adopted is designed to build consensus around SARI's current state and around desired areas for transformation. The assessment covered a range of issues of organizational development and benefited from the triangulation of diverse voices and opinions within and outside the organization. The following people were contacted: Representative of the Board of Directors, Director-General of CSIR, Deputy Director-General, R&D, research scientists of CRI, Director of SARI, senior staff/Scientists, finance and administration officer, program and administrative staff, key stakeholders (FBOs, MoFA, other research institutions, NGOs, PVOs, the Media etc) and other key development partners of SARI.

The assessment process involved five steps:

1. Meeting with SARI senior management and scientists to determine the scope and time frame of the assignment. To achieve concrete results from the various strategic discussions, each of the following nine (9) capacity areas: Strategic management, Human resource management, Financial resources management, Service delivery, External relations and Sustainability were divided into a number of competencies and sub-competencies as shown in the example below:

Capacity Area	Strategic Management	Financial Resource Management
Competency	Management Practices	Financial Management
Sub-competency/category	Planning	Control

2. Meeting with most of the senior SARI staff to explain the methodology and process, answer questions, determine who would be involved at various stages of the assessment, agree on travel plans, point of contact and on the next steps

3. Gathering of information by the consultants through key informant and focus group interviews of staff at the Institute and outstations and later interviews with various clients and other key stakeholders. Other specific questions that USAID wanted answered were also presented to key informants.

4. Holding of an analysis meeting to present the organizational assessment results to rank each category along a scale of (1) start-up to (4) mature

5. Travelling - trips, covering over 1,300 km were made to all the stations and substations in the Northern region -Nyankpala, Damongo and Yendi, Upper East region - Manga, Upper West region – Wa, Babile, Jirapa and Tumu, to get a first-hand view of the infrastructure, facilities and activities being undertaken and to have discussions with the management, scientists and support staff working at these locations.

In presenting the results, each competency was divided into sub-competencies or categories which are presented in the Participatory Capacity Assessment tool that was provided by the facilitators. The sub-competencies or categories represent important management functions of an organization which can reach different development stages or levels of effectiveness. The four development stages used in this assessment to indicate organizational effectiveness are shown below:

Score	Development Stage	Description
1	Nascent/ Founding	The beginning stage of organizational development. General characteristics of a start-up are: few individuals involved, not much history, generally very small.
2	Emerging/Developing	The second stage of organizational development which is characterized by rapid growth, high energy and much activity. Usually behind in its administrative functions because of the rapid growth.
3	Expanding/Consolidating	The third stage of organizational development, which is characterized by continued high quality service delivery and intensified focus on the other six areas of organizational development. It is a stage when the knowledge of the developing phase is *incorporated* into the organization
4	Mature/Sustaining	The fourth stage of organizational development. The organization is fully functional in the competency area

It was important to explain to the SARI staff that organizations evolve differently and this method being used in this analysis to gauge SARI's competency areas in terms of these four development stages will help to present a fair picture of the effectiveness of the organization. It was also made clear to the staff that this exercise will help SARI to define what it needs to focus on in order to move to the next stage of development if necessary.

An exercise was embarked on to rank all the categories during the analysis-meeting with SARI staff and when discussions and consensus suggested that SARI's current status does not fit exactly into a particular stage, the results were presented as trends within the organization. Further to the assessment of the Institute, various organizations that were deemed to be stakeholders of SARI, including other research institutions, MoFA and its agencies and departments, NGOs/PVOs, various private sector actors, farmer-based organizations, the media and farmers, were contacted and interviewed as key informants or focus groups to triangulate the results of the assessment rankings. The institutions and people contacted and interviewed are listed in Appendix 2.

III. RESULTS OF THE INSTITUTIONAL CAPACITY ASSESSMENT

ASSESSMENT OF ORGANIZATIONAL CAPACITY

The ranking of each category according to level of development is highlighted in grey. Where the result is not fully clear, an arrow is used to depict the trend.

TABLE 1A: RESULTS OF THE ANALYSIS OF ORGANIZATIONAL EFFECTIVENESS

Component of Organizational Effectiveness and Their Sub-Components	Nascent/ Founding	Emerging /Developing	Expanding/ Consolidating	Mature/ Sustaining
GOVERNANCE		2.6		
Board				
Mission/Goal		+*		
Constituency				
Leadership				
Legal Status				
MANAGEMENT PRACTICES		2.5		
Organizational Structure				
Information Systems	+			
Administrative Procedures			+	
Personnel				
Planning				
Program Development				
Program Reporting		+		
HUMAN RESOURCE MANAGEMENT		3.0		
Human Resource Development				
Staff Roles				
Work Organization				
Diversity Issues				
Supervisory Practices			+	
SERVICE DELIVERY		2.7		
Sectoral Expertise				
Constituency Ownership		+		
Impact Assessment				
EXTERNAL RELATIONS		2.3		
Constituency Relations				
Inter-Organization Collaboration				
Government Collaboration				
Donor Collaboration				
Public Relations				
Local Resources				
Media	+			

Component of Organizational Effectiveness and Their Sub-Components	Nascent/ Founding	Emerging /Developing	Expanding/ Consolidating	Mature/ Sustaining
SUSTAINABILITY		2.7		
Program/Benefit Sustainability			+	
Organizational Sustainability				
Financial sustainability				
Resource Base Sustainability				
FINANCIAL MANGEMENT				4.0
Planning				
Control				
Reporting				
Audits				
Separation of Accounts				
FINANCIAL VULNERABILITY				4.0
Funding Diversity				
FINANCIAL VIABILITY/ADEQUACY		2.0		

*+ indicates progression towards the next phase of the continuum (Nascent to Mature)

TABLE 1B: RESULTS OF THE ANALYSIS OF ORGANIZATIONAL EFFECTIVENESS

Component of Organizational Effectiveness	Number of Sub-Components (categories) Assessed per Component	Total Scores of sub-components	Average Score Per Component	*Stage of Development of Component
Governance	5	14	2.8	Emerging
Management Practices	7	18	2.5	Emerging
Human Resources	5	15	3.0	Expanding
Service Delivery	3	9	3.0	Expanding
External Relations	7	16	2.3	Emerging
Sustainability	4	11	2.7	Emerging
Financial Management	5	20	4.0	Mature
Financial Vulnerability	1	4.0	4.0	Mature
Financial Viability/Adequacy	1	20	2.0	Emerging

*Key to the Stage of Development of Component

Nascent/Founding: *The Component of effectiveness is in the earliest stages of development. All the components measured in the assessment are in rudimentary form or non-existent*

Emerging: *The organization is developing some capacity in effectiveness of the component.*

Expanding/Consolidating: *The organization has a track record of achievement in the component of effectiveness.*

Mature/Sustaining: *The component of effectiveness is fully functioning and sustainable.*

1. **The Strategic Management Area** (Governance and Management Practices, 2.7 average score, ranked in the consolidating stage of development). SARI has in place a 15-member Internal Management Committee made up of the director, deputy director, heads of the three regional farming systems research groups, head of the scientific support group, representative of the research staff association, representative of the senior staff association, representative of TUC, head of accounts, heads of the commercialization and information division and farm management, head of administration, scientific secretary and workshop manager to strengthen the management function of the organization and steer the affairs of the institute. In spite of this committee being in place it is obvious that the team is not able to influence the direction that SARI is taking, in terms of fulfilling their core mandate of providing the required services demanded by the farmers in the northern regions. Organizational capacity development program is most likely to strengthen the performance of the management team to steer the affairs of the institute towards its stated mission

   1.1 Mission: SARI's mission, "To conduct agricultural research in Northern Ghana with the aim of developing and introducing improved technologies that will enhance overall farm level productivity for improved livelihoods", is well known by staff, various stakeholders and the general public. This mission clearly articulates the services it will provide to its clientele. On the other hand, a great deal of SARI's work is also driven by donors and partners whose agenda do not necessarily harmonize with its current strategy of prioritizing and fulfilling the needs of its core-clients, the farmers. In this respect, SARI's mission is not being fulfilled and it is the responsibility of the Board and management that donor-funds are aligned to the mission of the institute.

   1.2 Board of Directors: The ranking is in the emerging (2) stage of development. The required procedures and regulations governing the board are in place and an attempt has been made to make it representative and inclusive by adding a woman, NGOs/PVOs and private sector participant in addition to a farmer. The board meets on a regular basis and there is active participation in board meetings and decision-making. Unfortunately, the board has neither been effective in attracting the required funds from government nor has it been able to ensure that donor funds are aligned with the stated mission of SARI. For this reason there are several fundamental needs that support research which are not met year after year.

   Recommendation: SARI requires technical assistance to develop and strengthen the capacity of the Board by providing Board governance training to enable the group to effectively drive changes that would lead to the harmonization of the institute's mission with the identified needs of the farmers in the northern region.

   1.3 Constituency: This category was ranked in the expanding (3) stage. Farmers, MoFA, Government, other research institutions, development partners, implementing partners (NGOs/PVOs) and other private sector actors in the agricultural industry are the constituency. Staff members of SARI are expected to be constantly aware of their needs by reaching out to this constituency and setting up effective communication strategies to engender inclusiveness and participation and to also benefit from potential additional resources from the constituents. Although it was stated by the senior staff of SARI that the institute already has a number of communication tools and mechanisms/processes in place to reach out to its constituency, the farmers, PVOs/NGOs and media practitioners contacted indicated that from their standpoint, these processes are inadequate and need to be improved and the successful ones also need to be scaled-up if SARI is to effectively reach a broad section of its constituency. Various

stakeholders also suggested that the advocacy skills of SARI are weak and need to be strengthened in order for the institute to lobby effectively on behalf of its constituents.

Recommendation: The institute requires technical assistance to develop a communications strategy and a website to market the institute and establishment of an advocacy skills capacity strengthening program would remedy the current situation.

1.4 Leadership: The team ranked this category in the emerging (2) stage. The leadership roles are well defined and clearly structured and documented by the CSIR and SARI organograms that detail the various authority levels and responsibilities in the current structure. The leadership has been successful in ensuring that the institute is running and doing research from year to year and the scientists are conducting good quality contract-research. It is, however, unfortunate that, with this understanding, the board and management of SARI have not succeeded in driving the institute to its mission. Presently the majority of research conducted is not determined by the farmer-client prioritized needs and there are many problems associated with infrastructure, equipment and other required facilities required to support the research endeavors.

Recommendation: The SARI leadership would benefit from the provision of leadership and management development training that would sharpen the skills of the team in the development and implementation of a performance-based management system that is tied to the institute's core mission and which would form the basis for measuring the performance of researchers and other staff of the institute.

1.5 Legal status: The team ranked this category in the mature (4) stage. Examination of records from the finance department indicated that SARI is in full compliance with statutory regulations including the reporting on tax, SSNIT and labor requirements. Furthermore, the organization fully integrates appropriate expert advice into management decisions (audit findings, investments, land acquisition etc.).

1.6 Organizational structure: The ranking assigned indicated that this category is at the expanding (3) stage. SARI has a defined organizational structure with clear lines of authority and responsibility (see section V). Each staff has specific roles and carries full responsibility for implementing assigned tasks. It also confers the necessary authority on individuals to permit them to operate effectively as demonstrated by operations in the substations. SARI's organizational structure is employed in supervisory sessions and performance evaluations. The structure exists but there are vacant positions for scientists in each of the 3 farming systems research groups. There are requirements for a weed scientist, virologist, nematologist, cotton and horticulture scientists that need to be filled.

1.7 Information systems: SARI is at the nascent stage for this category. Data utilization potential is well understood by the research and administrative staff. The institute also operates a monitoring and evaluation system to collect, analyze and disseminate data but most of the work is done manually by all departments except. It is only the finance department that has a modern Management Information System (MIS) to facilitate its work. Unfortunately only a rudimentary electronic Management Information System (MIS) is in place for managing research and administration data and report/information generation and it is also not accessible to all staff.

Recommendation: SARI urgently requires assistance to develop a comprehensive monitoring and evaluation system and to procure and install a modern MIS and subsequently, transfer the research and

administration data to this system to enable staff to safely input, store, process and produce reports efficiently.

1.8 Administrative procedures: The team ranked functionality of the administrative procedures as expanding (3). There is a dedicated administrator of the institute who oversees the operations of the department. The systems are formalized to provide guidance on human resources, travel, finance and administration and other relevant areas. An administrative manual exists and the administrative systems are functioning to a large extent.

Recommendation: There are several opportunities to further develop the data inputting, analysis and management system through the development of a comprehensive M&E system and introduction of a modern MIS to make data management procedures efficient.

1.9 Personnel: The institute is at the emerging (2) stage of development. All necessary personnel systems are formalized and implemented and are understood by staff although some of the staff interviewed thought these were too cumbersome. Formal employment practices are uniformly reviewed at the CSIR level to ensure consistency with the mission and policies of SARI. Currently, there are various vacant positions for scientist in disciplines which have not been filled although these positions are critical if SARI is to conduct its mission successfully.

Recommendation: There is a need for SARI to integrate personnel practices into the planning process and to seek staff opinion of human resource policies regularly so they become a part of the negotiations in hiring appropriate staff to fill critical vacant positions for required scientists to fulfill the mission of SARI.

1.10 Planning: Planning competencies are ranked in the mature stage. SARI is guided by a strategic plan that has been developed in 2005 to cover the period of 2006 to 2015 and has a good internal system for annual and quarterly planning, although there are opportunities to improve its planning approach. There are regular meetings and operational plans to plan its activities and there are also activities that are accepted and implemented on ad-hoc basis because of the opportunity the researchers seize on short notice to undertake various research tasks dictated by a funding agency. Understandably, SARI's planned and ad-hoc activities are part of its mission and are important to reach its goals. Hence it would be difficult to avoid some of the ad-hoc activities that bring in funds for its operations since the contribution of research funds from the Government of Ghana, according to data provided by the finance department, is never disbursed to the institute. Taking on such ad-hoc activities, therefore, requires that the researchers do more activity planning meetings including all relevant staff. M&E data are required to assist managers to rate their performance and to make changes in implementing their projects when necessary. Unfortunately, a table which shows the status of performance of each of the stated indicator against established targets was not found in the Annual Report which provided documentation on only the "Major Achievements and Progress Made in Research Programs" section of the report.

Recommendation: A training program to develop the Monitoring and Evaluation (M&E), Results-Based Management and Data-base Management capabilities would be useful in sharpening the performance of SARI in its planning and management functions. As part of a required capacity strengthening assistance in monitoring and evaluation and performance-based management, there is a need for the institute to develop a Program Indicator Tracking Table to track the indicators specified in

the institute's Log Frame document so that one can observe at a glance the performance of each indicator to date for management review and action. .

1.11 Program Development and Implementation: The team ranked this category in the expanding (3) stage of development. SARI has a comprehensive programmatic framework that is used as a planning and developing tool but in order to use this tool more effectively, this programmatic framework (detailed implementation plan) should be updated more frequently to also include ad-hoc activities that the institute continues to accept. The research agenda is most of the time imposed by the donor although the organization also has one it has developed for itself. Key indicators have also been identified, albeit not precisely enough, for monitoring and evaluation but in the absence of a Program Performance Indicator Tracking framework to facilitate timely performance review, lessons learned from monitoring and evaluation would be missed for application in future activities. Constituents are consulted as partners in program design (farmers are often not involved from the beginning), implementation and evaluation. The input of stakeholders is primarily done at the planning meetings and other activities organized by the office of the RELC that is chaired by a SARI Scientist who is embedded in the Regional Ministry of Agriculture office to facilitate communication of the needs of constituents. The collaborative implementation of various programs with selected partners also serves to involve constituents in the planning, implementation, monitoring and evaluation of projects undertaken by SARI.

Recommendation: The key problem areas associated with the implementation of prioritized farmer-generated research projects developed by the RELC require the establishment of a program of assistance for the development of appropriate strategies and solutions to make the system workable (this is dealt with in a subsequent section on operations of the RELC mechanism).

1.12 Program reporting: This category is ranked in the emerging (2.5) stage of development. The reporting systems are largely donor-driven and the scientists provide the information required by the donor in appropriate form. SARI has developed its own reporting system and is able to report to each donor or partner by using the appropriate formats. It has a system in place to publish and distribute information and lessons learned to donors, government and constituents interested in the results of its activities as and when required, however, the organization does not have a modern MIS for easy inputting and consolidating of data from various programs to ensure the generation of comprehensive program reports to share with its constituents.

Recommendation: Capacity building training in Results-based management, Database management, Communication and Public Relations and knowledge management is required for SARI to be equipped to provide user-friendly and useful reports that would be available to all constituents and thereby fulfill its mission to its clients.

2. **Human Resources Management.** This component describes the functions of human resource management The Department is responsible for hiring members of staff; this will involve attracting employees, keeping them in their positions and ensuring that they perform to expectation.

2.1 Human resource development: The ranking is emerging (2) stage of development. There is a match between staff responsibilities and skill requirements. However, there are several human resource needs such as reward and incentive-packages for staff, which required attention. There are also various vacant positions for selected subject-matter scientists that are yet to be filled. The human resource development plan of SARI is integrated with its strategic plan as demonstrated by the planned number

of different categories of scientists that are being trained in other universities at the MSc and PhD levels to occupy identified strategic positions in the short and medium term. SARI has also developed, but yet to be implemented, a capacity building plan for different categories of staff to sharpen their skills in specific areas and these have been well articulated by the institute. These training programs have been discussed under the staff training needs section of this report.

Recommendation: There is a need to roll-out this staff capacity building plan and SARI management has expressed its willingness and readiness to partner with other institutions and agencies to review and provide assistance to implement this plan.

2.2 Staff roles: The ranking for staff roles is at the expanding (3) stage. Jobs are well-defined and documented in job descriptions and work assignments. SARI has a large number of staff and the team observed, what was validated by the administrator, that each member has a clear role according to a job description and internal policies. The assessment showed that there is harmony between staffing structure and objectives of the organization as well as responsibilities and skill requirements. Discussions with various levels of staff also showed that staff roles are clearly defined and staff members are aware of their responsibilities. The roles of staff are also clearly defined in the organizational structure and there was evidence that staff have the ability and willingness to adapt to new job requirements as and when necessary. There are mechanisms for work planning and work review illustrated by the various planning sessions that have been institutionalized), working in teams (exemplified by three Farming Systems Research Group model for doing research in each of the three northern regions) and coordination (demonstrated by the established and functioning Scientific Support Group and work review). SARI's Management of the systems, that have been established, however, needs constant review and improvement.

2.3 Work organization: The team ranked competency in work organization in the mature (4) stage of development based on the comprehensive use of work plans and team approach adopted by SARI. Staff teams are self-directed and they organize their work around a clear understanding of the organization's mission and strategies. Staff is skilled in the use of a variety of techniques and methods to meet the organization's program objectives and appropriately use them. There is also an established system in place for inter-team planning, coordination and works review exemplified by the various coordination meetings. Staff members are able to shape the way in which they participate in management meetings and program review. Constituents are involved with management in making decisions that directly impact on them. It is, however, important for the SARI management to review this competency every now and then to ensure that task management is on track and this must involve all the relevant teams.

2.4 Diversity issues: This category which describes the level of representation of diverse interest groups of the constituency of SARI is at the expanding (3) stage of development. The composition of the board of directors does not yet reflect that of the constituents. For instance, there is a banker, deputy director-general, R&D, cognate director (CSIR-Animal research Institute (ARI) Director), MoFA and a private farmer. However, the gender balance is inadequate and the private sector involved in other agribusinesses and implementation partners (NGOs/PVOs) are not represented on the board.

Recommendation: There is a need to reorganize and expand the composition of the board to accommodate these missing interest groups so as to establish some balance in representation.

2.5 Supervisory practices: This category which assesses the relationships among staff members and conflict resolution as important factors that can impact on the achievement of the organization's

program objectives is ranked in the expanding (3) stage. SARI supervisors do recognize organizational development as an important management function and have established policies and methods to ensure growth of the organization. From the discussions, although the northern regions are fraught with many conflicts that cut across ethnic lines and affects all organizations working in the north, it does not appear that staff members have been trained in conflict recognition and resolution techniques.

Recommendation: It is necessary to provide training to all staff and new hires in conflict recognition and resolution techniques to ensure that workplace conflicts do not escalate and go out of hand.

3. **Service Delivery:** This component assesses the capacity to deliver quality services to clients and it is one of the strongest indicators of an organization's effectiveness.

3.1 Sectoral expertise: The team ranked this category in the mature (4) stage. Sectoral experience of SARI, in terms of technical capacity and knowledge of the northern regions terrain is very high. SARI is able to adapt program and other services delivery capacities to reflect the changing needs of its constituents (e.g. responding to donor requests for contract research). The institute is recognized as a capable and experienced research institution by donors, government and other organization as demonstrated by the many MoU and research contracts it has signed with several donors. Fee-for-service and other cost-recovery mechanisms have been put into some of the service delivery process through commercialization of specific services, however, the income obtained from commercialization activities is very low (2% of total budget in 2011) and there is a need to further exploit this opportunity to generate income for other uses in its programs.

3.2 Constituency ownership: The effectiveness of SARI in constituency ownership is in the emerging (2) stage of development. Although most of its current services are defined by other funding/donor agencies, it considers its constituents (farmers) to be equal partners in defining services to be provided and in the management of projects as demonstrated by the existence of a Research and Extension Linkage Committee (RELC) and an embedded SARI scientist in the each of the MoFA regional offices to coordinate activities of the RELC. In spite of the existence of this mechanism for generating and prioritizing the research needs of farmers in the northern region, only few (21%) of the recommendation of the prioritized research needs from the RELC are implemented. The reasons for this, according to SARI officials, are both financial and technical. It is important to note that the farmers' constituency is not fully on board since their needs are not being met. The responsibility lies on the SARI board and management to ensure that the funds required for farmer-generated research priorities are made available to fulfill their mandate to respond to the needs of the farmers in the northern region.

Recommendation: The board and management team need Advocacy training assistance to improve their performance in advocating for funds to remedy this dismal situation.

3.3 Impact assessment: This category is ranked in the emerging stage. Some measurable and appropriate indicators of success and impact have been determined and documented for projects and programs as indicated in its current log frame, however, it is doubtful if these indicators and impacts are monitored regularly to provide useful information to measure progress and highlight any implementation difficulties or successes. There is a conflict of interest situation for SARI to do a credible evaluation of its own performance. Best practice requires that there should be an independent impact evaluation to provide a more credible and objective evaluation to measure the impact of SARIa's programs to ensure that its mission is being fulfilled. In such a case it would have been found

and reported that the institute is not conducting research on problems prioritized by the RELC and hence the institute is not having a significant impact on its core constituents, the farmers.

Recommendation: There is a need for an assistance program to enable SARI to commission a third-party impact evaluation to determine the extent to which SARI is delivering its core mission and impacting the farmers in the northern regions so that a more objective and credible system of responding to the needs of the farmers could be developed.

4. **External Relations***:* This component describes how the constituents interested in its programs view SARI and the credibility that they have of the institution.

4.1 Constituency relations: The team ranked this category of organizational effectiveness in the emerging (2) stage. SARI operates from its headquarters in Nyankpala and from several field offices and substations representing the different farming systems in the three northern regions. Being both central and field-based in relation to its constituents, it involves constituents in decision-making and views its farmers as being responsible for providing information and counterpart resources as exemplified by protocols governing field trials and training activities. SARI also provides resources, both human and financial to enable its constituents to develop organizational capacity through activities such as training, farmer-field fora, field days etc. The problem SARI continues to face is its inability to successfully operationalize the recommendations of the RELC. Consequently, although the farmers view the institute as a partner, their aspirations are hardly ever met and they continue to remain cynical to advances made by SARI and MoFA.

Recommendation: SARI requires technical assistance to strengthen the weak links of the RELC mechanism designed to identify, consolidate and prioritize research needs of farmers in the northern regions.

4.2 Inter-organization collaboration: The ranking is in the expanding stage of development. SARI works with both international and local organizations in research projects and participates in and supports other sector networks and sometimes plays leadership roles in sector coalitions and promotes coalitions and partnerships of sector organizations. The various collaborations have been successful so far but there are greater opportunities for maximizing the potential benefits of inter-organization exchanges. The various roles the institute plays have been reported in another section of the report (SARI's Organizational Interdependencies and its Effect on Transformation).

Recommendation: SARI and its constituents would benefit greatly from an assistance program aimed at supporting inter-organization exchanges that can lead to stronger and more fruitful collaboration and expand SARI's capacity in technology generation and dissemination

4.3 Government collaboration: The category is ranked in the emerging (3)stage of development. SARI is seen as a reliable partner by the government and has formal mechanisms for collaborating with government, donors and other organizations and also provides input into policy-making issues in its area of expertise through CSIR. It is unfortunate, however, that due to the usual budgetary constraints, funds allocated to the institute only pay for salaries and other recurrent expenditure and very little is left for research activities. For instance, as at the time of the assessment, six months into the year, "item three" of the approved budget, which constitutes funds for research activities and materials, has not been disbursed to the institute by government and this adversely affects SARI's ability to do research on the prioritized areas specified by its farmer and private sector stakeholders. It is argued by staff of SARI that this situation hinders the conduct of farmer-generated research and it is only the availability

of other donor funds that enables the institute to deliver on a large portion of its mandate in the northern region. SARI's role in advocating for a change in this situation is urgently needed to enable the institute to deliver client-driven services. Although the lack of these funds is often given as the reason for SARI's inability to respond adequately to farmer-generated research priorities in the northern regions, it is also acknowledged that an indicator of organizational strength and leadership is the capacity of the leadership to find alternative solutions in a budget-poor situation.

Recommendation: This observation brings to the fore the need for capacity building training to strengthen the planning, prioritizing of research needs, budgeting and management of available resources by the Board and management of SARI to enable the institute to raise the funds required to achieve its overall mission.

4.4 Public relations: The ranking for this category is in the emerging (2) stage of development. The work of SARI is not very well known to the Ghanaian public and policy makers because its work is mainly in the northern region and the institute has not marketed its services and programs to the wider Ghanaian stakeholders. However, among other regional and international research institutions and development agencies, the institute has been able to use its reputation in the research and donor community to attract research funds and partners. According to the leaders of one of the institutes of CSIR, SARI has been able to engage decision-makers in dialogue on some policy and infrastructure issues. Discussions with key staff indicated that they understand the importance of public relations but the capacity to carry out public relations activities is weak.

Recommendation: Owing to the importance of public relations in garnering support from the public to enable it dialogue from a position of strength, it is imperative for the organization to set up: a media relations unit, a prominent web site and develop functional communication tools which would bring the activities of SARI closer to the various stakeholders including government and other donors.

4.5 Local resources: This category is ranked at expanding (3) stage. SARI works closely with various private sector organizations and local entities which contribute various resources (time, materials, and funds) and technical expertise as well as contribute to program results and their sustainability. The organization draws support from the local private sector and government agencies but project sustainability still depends on continued support from external donors who contribute about 86 % of the total research budget. SARI has 2 representatives of the private business sector serving on its board and so the interests of the private sector are represented at the highest decision-making level and the programs of SARI are also promoted to the private business sector through various alliances with NGOs and PVOs.

Recommendation: The set-up of a web site and training of appropriate staff in communication and public relations would also facilitate communication of the activities and programs with the private sector and enhance the participation and contribution of the private sector in the activities of SARI.

4.6 Media: The ranking for this category is in the nascent stage. SARI recognizes the need for media relations, knows the mechanisms for collaborating with the media. It has contacts in the local media which it uses when it wishes to inform the public about any important issue but according to some media practitioners interviewed the contacts were limited. The organization has systematic media campaigns, but this is not completely integrated into an overall public relations strategy and there is no public relations unit to serve as the mouthpiece of the institute. The director of a local multi-media organization suggested that, SARI needs to take advantage of the several opportunities to get wide

coverage of its programs and must have a media relations person to facilitate meetings with the media rather than depend on the institutes scientists since dissemination of technologies is a major problem that requires specialized attention. Discussions with the major radio station in Tamale also revealed that SARI buys air time to air specific programs and at the time of the assessment, there were four (4) paid for slots yet to be utilized by SARI. The director of the station believes that they could do more to promote the work of SARI if there is a concerted effort to develop a systematized program for doing this.

Recommendation: In order to take advantage of the many opportunities that good media relations could bring, it is essential that SARI should seek assistance to develop a public relations unit and a communication strategy that would enable it to engage with the public through the mounting of multi-media campaigns (e.g. postings on a well-developed website, newsprint, magazines, radio) that are integrated into a long-range strategic plan.

5. **Sustainability.** An organization is developing towards institutional sustainability if governance, operational systems, human resources and external relations are in place and effectively support the organization's work.

5.1 Program benefit sustainability: This category is ranked in the expanding (3) stage of development. The various constituencies of SARI recognize the benefits from services and programs of the institute. It is important to note that SARI does not currently have the structure and resources to reach a large segment of its constituency. Most of the technologies it develops are disseminated and promoted by MoFA extension agents and NGOs/PVOs who work directly with farmers in the northern regions. Its program activities are important to and owned by the constituents and it has developed systems for short and long-term continuity. In limited cases, for instance, SARI conducts and supervises adaptive trials on select farmers' fields in its operational areas for a couple of seasons and when the farmers see the benefit of the technology, they adopt it and continue to practice it without further supervision from SARI and it is hoped that other farmers will also follow suit to adopt these technologies. The impact of adaptive trials would however, depend on overall number of farmers receiving this assistance and the more SARI does the more would be the impact.

5.2 Organizational sustainability: This category is in the expanding (3) stage of development. SARI has a clear vision and understanding of its role as a research institution serving poor rural communities in the northern regions to increase food security and reduce poverty. It is a leader in forming coalitions and networks with other organizations and participates in activities concerning the sector. Various alliances, partnerships and collaborative arrangements involving SARI have been reported in other sections of this report.

5.3 Financial sustainability: This is ranked in the consolidating to emerging (3) stage. SARI has developed and diversified its resources base to continue longer-term activities. At the time of the assessment, SARI had MoU and contracts with 32 donors and other institutions. Whether this expansion of research contracts would continue year after year is not, however, certain. Furthermore, SARI has, in a small way, developed fee-for-service and other cost recovery mechanisms built into service delivery to earn extra funds for its activities but the contribution to the overall income of the institute is meager and cannot be relied on until the commercialization strategies and plans are fully implemented.

Recommendation: There are many opportunities available the board and management of SARI to expand the commercialization activities of the institute and this could be achieved through the development of a business plan and full implementation of planned and funded commercialization activities. SARI should also develop strategies for local support from other partners for some of its ongoing activities.

5.4 Resource sustainability: The category is ranked in the expanding stage. . Currently funds are available to SARI from non-government sources and are tied to particular projects and program areas that may not necessarily be priorities of the farmers in the northern region. . Although the Government of Ghana funds for conducting research are not often released, SARI has been able to continue its operations due to these donor funds. There are, however, inadequate funds for undertaking much of the SARI/MoFA/farmers-generated and prioritized research.

Recommendation: It is only when the board and management of SARI are able to raise additional operational funds through various strategies to offset the deficit from government funding that the institute could begin to enjoy resource sustainability.

6. **Financial Management.** This area of management of financial resources and timely and accurate reporting are often of great concern to donors because of the weak capacity of many program/project implementers. SARI's achievements depend to a large extent on the funds it has available and how well it plans or budgets to meet its financial needs and how it monitors and reports on its financial state. In addition to these requirements for adequate resources and good cash flow, it must have other sources of funds to enable it function since government subvention for their main research activities seldom reaches the organization. Its financial vulnerability is considerably reduced if it is able to diversify its funding base and avoid over-reliance on a single source of funding. Finally, SARI is less vulnerable if it could find means to recover some of its costs from fees it charges to its clients when it delivers various services to them and additionally, take advantage of the various income generating activities it can engage in to raise extra revenue using the same facilities it has available.

The financial management review conducted during the assessment revealed that SARI has done quite well in the management of its finances (ranking of mature stage of development). SARI has credibility with the various donors by meeting international standards in grant management as demonstrated by the regular reporting to donors and the regular annual external audits and the absence of serious, negative findings in the management reports of the auditors.

6.1 Planning: The ranking is in the mature stage of development. The analysis showed that financial planning is done based on the organizational budget and includes the overall financial condition in long-term organizational planning and management. Budgets are maintained on project-by-project basis. Future needs/projections are clearly defined and accounting procedures and data systems are well documented to provide a good view of the financial health of SARI. Adherence to the annual budget is very difficult since government funds meant for research are often not disbursed as and when needed. There are various short-term and ad-hoc funding opportunities during the year which are not factored in the development of the master budget. The budgeting process is integrated with the operational planning process and is adjusted as project implementation requires.

6.2 Control: The ranking is in the mature stage of development. Financial controls are a strict requirement in the organization. All required financial control systems (stock control, fixed assets

purchases, cash management and bank reconciliation) are in place to manage assets. Procedures to prevent conflict of interest, ethics violations and fraudulent activities are in place and enforced by the internal auditor's office and cash management duties are segregated. The management of physical assets includes procurement, maintenance, and record keeping of equipment

6.3 Reporting: The ranking is in the mature stage. SARI has in operation "state-of-the-art" accounting software "SCALA" and a dedicated server that has been networked in the accounts department to allow the input of data promptly and to facilitate quick access to reports. In spite of the many different projects being undertaken by SARI (32 in 2012), high quality, clear and complete financial reports are generated on a timely basis for reporting to appropriate funding agencies, partners, government and statutory bodies (Internal Revenue, SSNIT) which have strict reporting schedules. From our discussions and inspections at the finance office, we observed that the system in place can quickly generate various reports and provide an overall picture of the financial health of the organization at the touch of a key on the computer.

6.4 Audits: The ranking is in the mature stage. External audits are performed regularly (Egala, Atiso and Associates). The team had the opportunity to inspect the reports covering the past 3 years – 2009, 2010 and 2011. Very minor recommendations were suggested in the most recent audit management report and the main one related to fixed assets register. At the time of the visit, the recommendations had been complied with

6.5 Separation of accounts: The ranking is in the mature stage. All project funds are separated for different projects within the organization and adequate controls are in place to avoid cross-project financing.

7. Financial Vulnerability

7.1 Funding diversity: The ranking for funding diversity, which is a category of the financial vulnerability component, is in the mature stage. In 2010 funds from AGRA constituted about 45% of the total donor-funding received by SARI. In 2011, the percent (%) contributions to the total SARI budget by various sources were: Government of Ghana - 53%, donors and partners - 45% and internally generated Funds - 2%. Funds for specific projects sponsored by outside donors and partners are adequate to pursue the specified agenda and requirements of those donors, however, funds from the government that are meant to respond directly to the client-driven research agenda are very much inadequate and the Board and management have to develop winning strategies to reverse this situation.

7.2 Financial Viability/Adequacy: This component is ranked in the emerging (2) stage of development. Although there are enough funds to cover donor-funded projects, the requirements for other identified local, client-driven priority research are not usually met. The majority of research conducted by SARI is driven by donors whose agenda, although consistent with SARI's mission, may not necessarily reflect the priorities of SARI's clients, the farmers in the northern regions. SARI also provides some of the needed research funds from the institute's internally-generated funds to cover some of the research activities identified but not funded by any donor. Unfortunately, only about 2% of the total funds received by SARI are from internally generated funds. The expansion of income generating activities through commercialization of identified activities is a necessary strategic decision that needs to be taken by the institution to increase its financial adequacy.

Recommendation: SARI would greatly benefit from assistance to develop a business plan to guide its commercialization effort.

IV. REVIEW OF SARI'S PERFORMANCE (2005-2012) - IS SARI ACHIEVING ITS ESTABLISHED TARGETS?

ANALYSIS OF THE SARI LOGICAL FRAMEWORK

For SARI or any interested party to know whether the institute succeeded or failed in its mission of conducting agricultural research in Northern Ghana with the aim of developing and introducing improved technologies that will enhance overall farm level productivity for improved livelihoods, there needs to be a good M&E system in place The assessment team did not find a results framework (that specifies the goal, objectives, intermediate results, activities and well defined indicators), an M&E or performance monitoring plan in place at SARI. The institute, however, has in place a detailed Logical Framework which shows various targets and indicators (see Appendix 3) The Logframe has specified the following long-term development goals and accompanying short-term objectives:

1. a. Long-term development goal of strengthening the capacity of staff to conduct and support appropriate research and development from 2005 to 2012

   b. Short-term (2006-2008) objectives of developing a mechanism for staff orientation and establishing appropriate incentive packages were achieved.

2. a. Long-term goal (2005 to date)of improving and maintaining infrastructure and facilities to support research and development

   b. Short-term objectives (2006-2008) of rehabilitating and upgrading existing infrastructure and facilities by providing a comprehensive inventory/list on the state of infrastructure and facilities and to draw up maintenance schedule at divisional level to be operationalized

3. a. Long-term (2006 to date) goal of developing and implementing a market and client-oriented sustainable research programs

   b. Short term objectives (2006-2008) of developing and implementing a market and client-oriented sustainable research programs

4. a. Long-term goal of enhancing its capacity to mobilize and manage resources for research activities

   b. Short-term objectives (2006-2008) of promoting and marketing research outputs

5. a. Long-term goal of strengthening organizational structures and processes for enhancing service delivery

   b. *Short-term objective of reviewing and making functional the organisational structure of SARI* and *the short-term objective of streamlining and functionalizing management systems and operational procedures*

The problem with the use of this Logframe to assess the performance of SARI is that the indicators are not well defined for easy measurement and hence, it is difficult to develop appropriate data capture forms for use during monitoring exercises. Furthermore, there is no differentiation between impact and process indicators and there were no baseline data that would facilitate the measuring of progress towards the established target. Finally, there is no Indicator Tracking Table (PITT) to allow easy tracking of progress of interventions specified in the document. The SARI team had to find the data on performance of the various indicators by searching through several documents prepared by the institute. There is a need for SARI to develop a comprehensive Results Framework that specifies the goal, objectives, activities, outputs (intermediate results) and the indicators for measuring performance. Furthermore, SARI also has to develop a Performance Monitoring Plan (PMP) to allow the institute to get a clear idea about what the indicators are, the units of measure, indicator definition, sources of data, responsible persons to collect the data, how frequent the data should be collected etc and the type of data collection tools that need to be developed.

Recommendation: SARI needs technical and training assistance to build its capacity to develop and manage a robust Monitoring and Evaluation (M&E) System to measure its performance and remain accountable to its constituents.

V. REVIEW OF NATIONAL AND CSIR AGRICULTURAL RESEARCH POLICIES AND PRACTICES AND THEIR IMPACT ON SARI'S EFFECTIVENESS AND AGRICULTURAL PRODUCTIVITY IN THE NORTHERN REGIONS

The principles underpinning the policy on research at the national level are: the exploitation and application of science, technology and innovation, pro-poor farming populations, food security, poverty reduction, sustainable development and improved quality of life. The policy framework at the national level ensures that these principles are integrated into the main functions and operations of the Council for Scientific and Industrial Research (CSIR) and SARI. The national science, technology and innovation policy of the Ministry of Environment, Science and Technology (MEST) is "to provide a framework for stimulating innovation in the economy and in the society. It has the mandate to promote science and technology application in the country and to create the conditions for innovations. It also seeks to establish a strong national scientific and technological base for accelerated sustainable development of the country to enhance the quality of life for all."

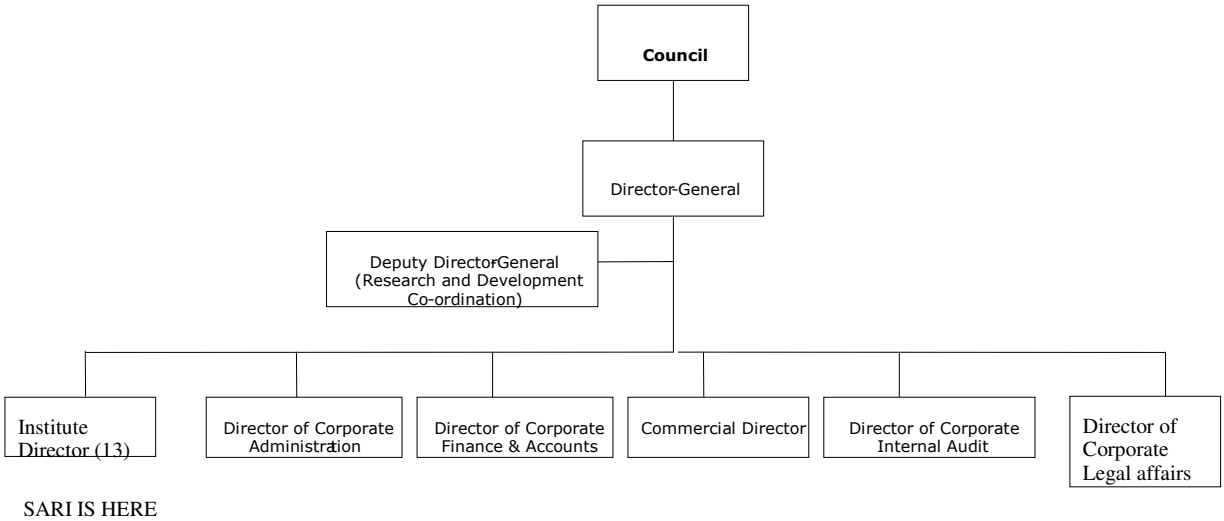
CSIR is among 4 organizations that operate under the MEST and its mission: "to generate and apply innovative technologies which efficiently and effectively exploit Science and Technology (S&T) for socio-economic development in the critical areas of agriculture, industry, health and environment and improve scientific culture of the civil society", is implemented within the framework of the national policy. The Council is mandated to generate part of its income through the sale of its products and services and to institute a system of contract research. The mission of the Savanna Agricultural Research Institute (SARI), which is one of the 13 institutes of the CSIR, is "to conduct agricultural research in Northern Ghana with the aim of developing and introducing improved technologies that will enhance overall farm level productivity for improved livelihood in the regions."

While the policies and missions of MEST, CSIR and SARI all aim at the overall development of science, technology and innovation for accelerated development of the country, they operate at different levels of the socio-political spectrum and impact specific clientele and locations in the country. Discussions with staff of MEST, CSIR, MoFA and SARI revealed that there were no apparent disparities in the policy, practices and protocols governing research among MEST, CSIR, MoFA and SARI. While the MEST provides the framework for stimulating scientific research and innovation in the economy and society, CSIR is mandated to advise the MEST Minister on scientific and technological advances likely to be of importance to national development, coordinate all research activities in the country and eventually help implement government's policies on scientific research and development. CSIR and SARI are semi-autonomous and the Governing Council and the Management Board, respectively, are empowered to take

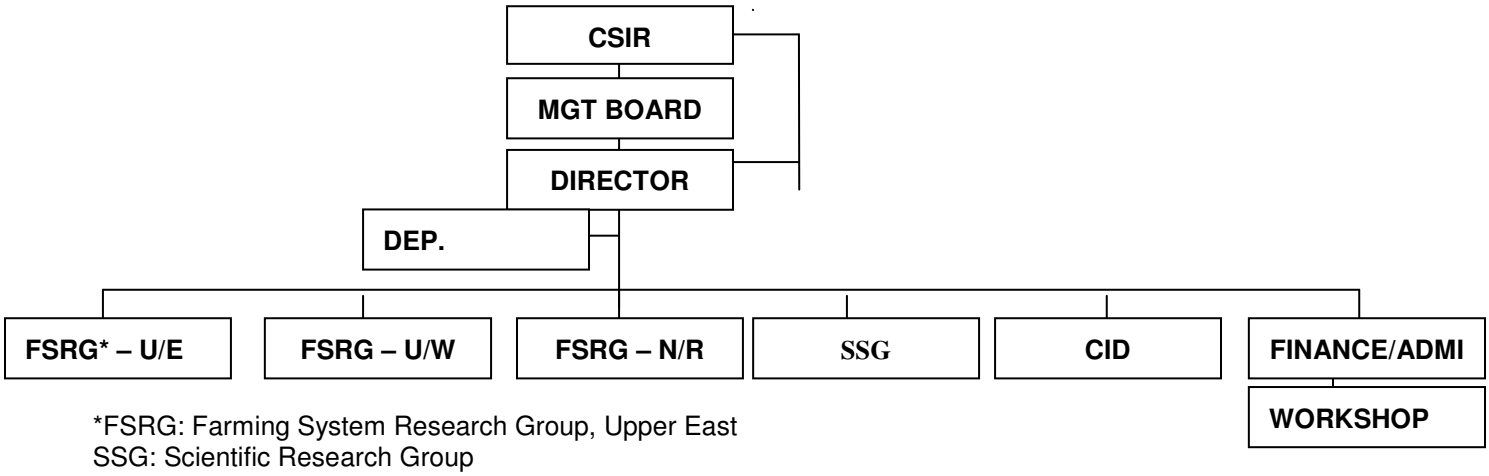
decisions without having to seek approval from the Sector Minister (MEST) in accordance with CSIR Act 521 of 1996.

The policies, practices and research protocols of CSIR provide a flexible framework which impacts positively on SARI's ability to do its work without undue interference as shown by the organograms below.

ORGANIZATIONAL STRUCTURE FOR MANAGEMENT OF CSIR



CSIR-SARI ORGANIZATION CHART



*FSRG: Farming System Research Group, Upper East
SSG: Scientific Research Group
CID: Commercialization and Information Division

VI. WHAT IS SARI'S AUTHORITY TO CARRY OUT ITS BUSINESS WITHOUT THE INTERFERENCE OR BLESSING OF CSIR

The job description of the Director of the institute states He/she is:

- Responsible for the day-to-day administration of the affairs of CSIR-SARI
- Responsible for establishing effective linkages with relevant institutions and agencies within and outside CSIR
- Responsible for the coordination of prioritized research of the institute under the broad guidance of the Director General
- Ensures promotion and transfer of technology to industry and agri-business
- Coordinates research funding initiatives
- Provides services and inputs to determine research priorities as well as formulate and implement science and technology plan
- Has overall management and development of the human resource base of CSIR-SARI

The job description above shows that the Director has the authority to implement the programs of the institute without interference from the Director General of the CSIR.

VII. WHO SIGNS MOU WITH EXTERNAL DONORS AND PARTNERS AND WHAT IS THE FUNDING FLOW?

The Director of SARI signs all MOU between donor agencies and the institute and the funds are sent directly to the dedicated accounts of the institute. Evidence of various signed MoU are available at the institute.

VIII. WHAT IS THE ROLE OF THE MINISTRY OF ENVIRONMENT SCIENCE AND TECHNOLOGY (MEST) AND THE MINISTRY OF FINANCE AND ECONOMIC PLANNING (MOFEP) IN NEGOTIATING FUNDING FOR SARI?

The present procedure is that the Ministry of Environment Science and Technology and the Ministry of Finance and Economic Planning could be notified about the intended use of funds that have been given to SARI, but they are not involved in the negotiations, award and disbursement of funds to the institute.

IX A. ANALYSIS OF SARI'S ABILITY TO SUPPORT AND ADVANCE PRIVATE-SECTOR-LED AGRICULTURAL TECHNOLOGY GENERATION AND DISSEMINATION

There are various financial, institutional, socio economic and cultural challenges that confront SARI in dealing with the private sector participants (producers, FBOs, processors, input suppliers, marketers and NGOs/PVOs), who are expected to determine the research agenda of the institute. In spite of these challenges, the institute has established systems and practices to enable it support and advance agricultural technology generation and dissemination by these participants in the agricultural industry. These systems and practices, however, are not adequate to make the institute responsive to tap into the resources of the private sector and so the institute's ability has been limited in this respect.

Although the private sector continues to conduct its own research, its involvement with SARI in agricultural technology generation relates to the contribution of information on its research needs to the MoFA-Agricultural Extension Agents (AEAs) at the field level, the AEAs in turn pass this information on to the MoFA district directors and then to the Research Extension Linkages Committee (RELC). This committee, chaired by a SARI Scientist "embedded" in each of the MoFA regional offices, receives the information on needs for discussions on priorities that should be tackled by the institute. This innovation is a good thing. In practice, however, SARI has had limited capacity to implement the research priorities of the RELC. For instance, between 20xx-20yy only 21% of the expected 90% of research proposals developed and implemented came from the RELC recommendations. Hence the private sector's priorities do not often get implemented by SARI researchers.

With respect to technology dissemination, there are several methods that are employed by SARI to reach the private sector (including farmers) with outputs of its research among which are the following tools: publications, establishment of demonstration farms in collaboration with MoFA, bimonthly training of MoFA frontline staff, seminars and workshops, field days, farmer visits, farmer field fora, production guides, technical factsheets, radio programs, folders and flyers. Among the partners the institute works with in the effort of disseminating research results to the public are: MoFA and various NGOs/PVOs who need these these services and facilities for their extension work with farmers. Unfortunately, the coverage of farmers through these efforts is limited and constrained by the sheer size of the northern regions, as well as, various logistical and funding problems of MoFA and other service providers engaged in extension and technology dissemination. The weak links in the chain of activities to improve dissemination of technologies have been identified by the institute and MoFA (please refer to diagram in section XIV). For instance, the linkages between SARI (which assembles research results) and the RELC system (responsible for packaging of research results for extension by MoFA and NGOs/PVOs) and also between SARI (assembling of research results) and use in demonstrations (farmer field school/training of farmers for adoption - marked yellow) have been shown to be very weak

Recommendation: There is need for a technical assistance program aimed at assisting SARI to develop a strategy to strengthen these identified critical research-extension linkages to ensure effective dissemination of technologies it continues to develop.

There is an informal system in place to support and advance private sector-led technology generation. In this system, the private sector proponent initiates a private deal with a SARI researcher who proceeds to conduct the required research after which the results and recommendations are given to the private sector proponent of the research for his/her use. The problem with this system is that the institute is denied the opportunity to evaluate the request to ensure that it is a priority need and consistent with the food security objectives of the institute. Furthermore, it is also most probable that the funds generated in this transaction do not benefit SARI to boost its income from these sources.

Recommendation: There is a need to streamline this procedure so that the institute becomes an integral part of any agreements reached between proponents of specific research and SARI as an institution to ensure that some of the benefits would also go to the institute.

There are several small successful projects in which SARI has been directly involved, which exemplify its role in supporting and advancing technology dissemination by the private sector. An example of this is found in SARI's partnership with IFDC and the Ghana Agricultural Association and Business Information Center (GAABIC) in the successful implementation of the Agricultural Value Chain Mentorship Program (AVCMP) in the northern region. IFDC worked closely with selected SMEs (input dealers, farmers, processors and marketers) in a mentorship program to secure and expand the output markets. SARI provided training directly to the farmers in Integrated Soil Fertility Management (IFSM) technologies; GAABIC worked with input dealers to assist them to develop the inputs markets and increase their capacity to provide better services to the farmers.

In another example, information provided by SARI on seed varieties, production, harvesting and post-harvest technologies are used by private sector ICT-providers using the SMS platform to disseminate agricultural technologies, prices and other critical information in the form of telephone text messages to farmers and traders who subscribe to the service. All these mechanisms are means used by SARI to promote private sector technology generation and dissemination.

Recommendation: There are several opportunities for scaling-up some of these projects that SARI has been implementing to enhance the promotion of technology development and dissemination by the private sector. It would be beneficial to provide assistance to SARI to design and expand such successful projects with its various partners.

IX B. SARI'S POTENTIAL FOR RE-ORIENTATION IN SUPPORTING THE PRIVATE SECTOR-DRIVEN RESEARCH AND TECHNOLOGY GENERATION

It was agreed among various respondents, during the assessment, that SARI has the potential and ability to re-orient itself to meet the emerging requirements for engagement with the private sector. Various strategies to provide pathways for re-orientation of the institute to further foster private-sector-driven research and technology generation to meet the needs of its core clientele were suggested by SARI scientists. Among these suggested strategies are the following:

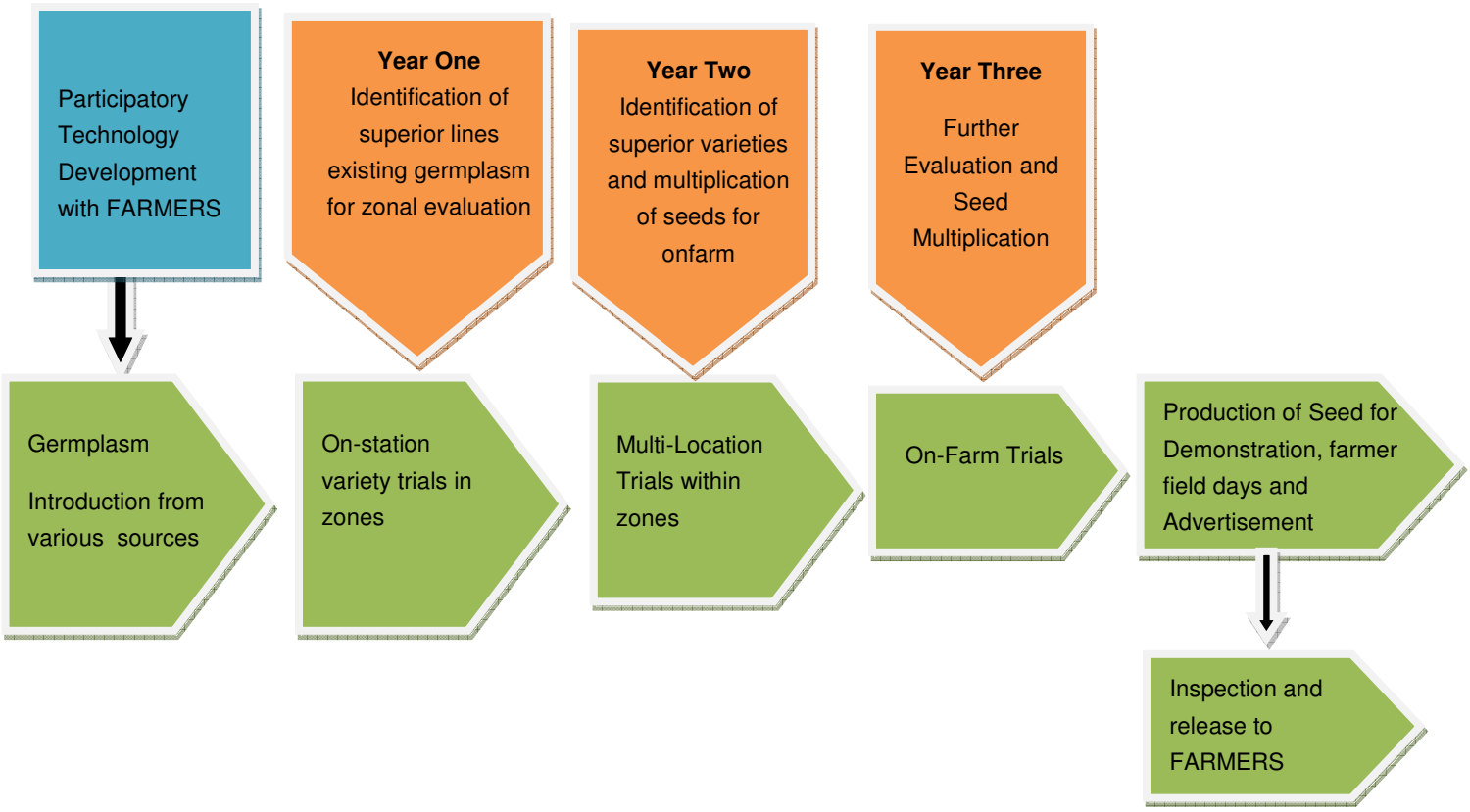
- Development of more comprehensive and formal institutional-level MoU to avoid the practice in which private contracts are given to scientists on a personal level (it is not advisable for SARI scientists to work outside the institutional arrangements).
- Establishment of transparent fee-for service mechanisms to attract the private sector to use the services of the institute in providing solutions to their research needs.
- Publicizing the willingness and capabilities of SARI in providing answers to various research problems of the private sector through various multi-media channels.
- SARI getting more involved in the activities and operations of various appropriate partners to help them identify their research needs which the institute or any of its local and international partners could provide answers to.

SARI creating a discussion platform to encourage and engage the private sector to participate and invest in more activities that drive technology generation and dissemination such as discussed in the relationships with the AVCMP, Premier Foods and ICT companies.

X. REVIEW OF THE ABILITY AND WILLINGNESS OF SARI TO IDENTIFY, ADAPT AND PROMOTE PROMISING TECHNOLOGIES FROM OUTSIDE CENTERS OF EXPERTISE

SARI has developed protocols for identifying and promoting promising technologies to farmers from outside centers of expertise as demonstrated by the various technologies it has promoted to meet various needs of its constituents. One of such protocols in place describes the development and release of new varieties. It begins with the identification of the needs of farmers through a Participatory Technology Development (PTD) process show in the Scheme below:

PROTOCOL FOR RELEASE OF CROP VARIETY



The PTD provides a forum for farmers and researches to identify farmers' technology needs in the production of a particular crop. Results from the PTD sessions are sent to the RELC for prioritization and onward transmission to SARI to review and to find a source of germplasm or process from other international research centers such as IITA, Africa Rice, ICRISAT, etc.). The germplasm/technology received from the external institutions is evaluated at SARI Nyankpala station after which promising lines are sent to the outstations for multi-location on-farm testing for validation. The most superior line from all these efforts is then released as a new variety for promotion and dissemination to farmers.

Several examples promoted external technologies which demonstrate the institute's ability and willingness to identify adapt and promote promising technologies from outside centers of expertise, are listed below:

- **Rice Varieties**: GR 18, GR 19, GR 20, GR 21, Digan (IR 12979-24-1, TOX 3107 and TOX 3050, IRAT 262, IRAT 216,, AFRO 15, Gbewa Rice (Jasmine 85, Nabogu Rice (TOX 3233-31-6-2-3-7, Katanga Rice (TOX 3972-10-1-2-1-1-3-2) NERICA 1 and NERICA 2.
- **Groundnut Varieties**: Sinkarzei, F-mix, Mani Pinta, Chinese (Shi Tao Chi), JL, 24, Endorpo Munikpa (SARGV 88001), Nkatie SARI (SARGV 88002) Gusie Balin (ICGV 92009) and Kpaneli (ICGV 90084).
- **Cowpea Varieties**: Bengpla, Valeenga, Marfo-tuya (SUL 518-2. Apaagbala (ITxP-148-1), Padi Tuya (SARC3-122-2), Songotra- "No Striga" (IT95K-499-35), Bawutawuta "No Striga" (IT95K-193-2) and Zaayura "Everybody likes it" (SARC4-75).
- **Cassava varieties**: Nyeri-Kogba (91/02324), Eskamaye (91/02327) and Fil-Ndiakong (92/0067).
- **Cotton Varieties:** FK 290, SARCOT 1 and SARCOT 5.
- **Pearl Millet Varieties**: Millet variety Manga Nara and Tongo Yellow.
- **Sorghum Varieties:** Naga White, Kadaga, Framida and Kapaala.
- **Soybean varieties**: Salintuya-1 and Salintuya-2, Jenguma (TGX 1448-2E) and Quarshie (TGX 1445-2e).
- **Other Technologies:** Tillage systems and seedbed types, Pre-rice cowpea for soil fertility maintenance and increased production, Use of improved fallow for soil fertility maintenance in Inland valleys, Insecticides from neem (*Azaridica indica*), Roanstar EC as a pre-emergence herbicide for rice, Control of wild rice (*Oryza lingistatminata)*. Optimal date of planting, Plant population and fertilization of soybeans, Sorghum and millet transplanting, Cotton/Cowpea intercrop, Groundnut being the best preceding crop for maize production in the savanna zone, A method of impacting cowpea integrated pest management tenets and practices for extension workers and farmers, Neem-incorporated management strategy for cowpea pests, Benefits of manure and/or mulch on cereal yield, Management of Pigeon Pea in short fallow for crop/livestock production systems in the Guinea savanna zone of Ghana, The best management option of *Callopogonium* short-term fallow, Crop rotation using leguminous trap crops, A scouting system for managing bollworm on cotton, Design and construction of greenhouse driers to dry hot peppers and Blanching of hot peppers employing the solar blanching technology.

SARI has been quite successful, as shown in the examples above, in adopting and adapting technologies that have been generated in other local and external institutions resulting in the reduction of the time other resources required to develop these technologies from start at the institute.

Recommendation: There are opportunities for interested partners to designing assistance programs aimed at (a) developing more of such successful new technology generation projects through identification, adoption and adaptation of technologies that are needed by farmers and (b) scaling-up the promotion efforts for the successful and high impact technologies that would benefit a critical mass of farmers in the northern regions,

XI. SARI'S CAPABILITY IN ADVOCATING AND INTRODUCING BIOTECHNOLOGY IN ITS RESEARCH AND DEVELOPMENT PROGRAMS

There are several examples that demonstrate SARI's activities in advocating and introducing new technologies, including biotechnology in its research and development programs. Some of these examples are provided below:

- SARI has teamed up with a private sector international biotechnology program through the activities of a research scientist at the Manga station (UW) who was informed, during a discussion with an old schoolmate working at Nestle Ghana, that the research and development branch of Nestle Cote d'Ivoire was looking for a scientist to participate in the testing of 3 bio-fortified hybrids of pearl millet with iron and zinc nested into the varieties to improve the nutritional quality. The discussions resulted in the signing of a MoU between the SARI and Nestle Cote d'Ivoire and the research is on-going demonstrating SARI's ability to work with the private sector in generating bio-technologies to solve specific problems of users. Although SARI seized the opportunity to collaborate with Nestle, this relationship was a one-time project and did not arise from a formal, systematized process to ensure institutionalization, replication and possible scaling-up.

- A second example relates to work by SARI at the Manga station on host-plant resistance of cowpea. The entomologist at the substation identified an aphid resistant cowpea in his trials and decided to undertake introgression of the gene into the traditional cowpea varieties, a process that requires the identification of a genetic marker to identify the gene. There are currently, no biotechnology facilities and capacity at SARI for molecular work and so the researcher contacted a private institution, Kirk House Trust of UK for assistance in supporting the breeding effort. Kirk House offered training to the entomologist in molecular biology techniques at the Ghana Cocoa Research Institute, Tafo, which has a biotechnology laboratory developed by Kirk House. Through the provision of the laboratory facilities and reagents needed for the work, the researcher was able to use a DNA marker to identify the gene for aphid resistance and has succeeded in incorporating this gene into one of SARI's promising cowpea lines that are being cultivated, a process which could shorten the breeding period remarkably. Since there are no biotechnology facilities at SARI, the scientist is obliged to go to the Cocoa Research Institute to do selection of the breeding lines using the genetic marker and the collaborations continues.

- A third example relates to the Nitrogen-fixing bacteria inoculant production and testing work at SARI in collaboration with the African Brazil Marketplace Innovation Project (EMBRAPA) that represents on-going research using biotechnology. The Marketplace is intended to open a new source of expertise to Africa to identify and target pro-poor, smallholder-based projects utilizing Brazilian innovation research. The project – "Enhancing small-holder cowpea legume production using Rhizobium inoculants" is being conducted at the various SARI stations and outstations. A SARI scientist was trained in Brazil on the techniques for making inoculants using Rhizobium bacteria developed at EMBRAPA. The researcher subsequently came back and established a small rhizo-biology laboratory at SARI for manufacturing inoculants. The inoculants are now being tested in farmer-field trials and the

most superior line would be commercialized and given to input dealers to promote and sell to producers of cowpeas.

A final example relates to the collaborative ongoing cassava breeding work among EMBRAPA, Cornell University (USA), Agriculture Research Institute - Tanzania and SARI. This work involves the identification of the physiological traits that make cassava one of the most drought tolerant crops, and determination of the genetic variation for these traits that can be exploited through plant breeding for crop improvement. Since polygenic, quantitative traits such as drought tolerance are difficult to screen using conventional phenotyping methods there is a need to turn to biotechnology. To date molecular markers do not exist for drought tolerance in cassava. This project seeks to use genetic marker-assisted breeding that can provide accuracy in selection and increasing heritability by reducing the confounding effects of non-additive components such as dominance and the effect of the environment, which are substantial in cassava. The project is going to map, using molecular markers, the Quantitative Trait Loci (QTLs) which are stretches of DNA containing or linked to the genes associated with drought tolerance.

The capability of the SARI research scientists to introduce biotechnology in SARI's research and development programs has been aptly demonstrated in these examples and represents a major strength of the institute. These activities, however successful they have been, do not demonstrate SARI's capability in developing strategies, taking actions and proposing solutions to influence decision-making by the board and management of the institute to create systematized processes and on-site infrastructure for the introduction of biotechnology into its research and development programs. The observations on the advancement of biotechnology-based research underscore the importance of establishing a biotechnology laboratory at SARI to facilitate its work.

Recommendation: There is a need for SARI to develop a plan for equipping its nascent biotechnology facilities and a scheme for soliciting public support to positively influence the promotion of biotechnology at the institute.

XII. ANALYSIS OF SARI'S ABILITY AND THE EXTENT TO WHICH IT IS LEVERAGING RESOURCES FROM MULTILATERAL DONORS AND PUBLIC AND PRIVATE PARTNERS

SARI has done an appreciable job in using its position in the northern regions of Ghana and its track record and capacity to do high quality research to access resources from several organizations to pursue various research priorities. The number of successful proposals and research projects funded by donors and partner-organizations in the past 6 years (2005-2012) numbered one hundred and ninety (190) and are shown in the Table 2 below. Currently (2012), there are 32 privately-funded projects being undertaken and the list of projects include the following: (1). SARI AGRA SHP, (2). SARI AGRA SOYBEAN, (3) SARI AGRA COWPEA, (4) AVCMP, (5) PROMIS 2, (6) EU/SARI JATHROPHA, (7) EBRAPA, (8) CDWF VI, (9) GDC–YAM, (10) GDCT–SORGHUM AND MILLET, (11) GDCT–COWPEA, (12) JIRCAS, (13) FABS–STRIGA, (14) GDCP CASSAVA, (15) IPA, (16) N2 AFRICA, (17) RSSP, (18) DTMA, (19) IFDC QUEFTS, (20) PEANUT CRSP, (21) WAAP, (22) RTIMP, (23) ASRI/CORAFF. (24) CPWF V 3, (25) CPWF VI, (26) KIRK HOUSE, (27) INSORMIL, (28) TL 2 GROUNDNUTS, (29) TL 2 COWPEA, (30) USAID RICE, (31) GCP-SARI and (32) YIIFSWA.

Table 2 Analysis of the number of research projects undertaken by SARI from 2005 to date and the key sources of funding for the projects are shown in the Table below:

Funding Source/Year	2005	2006	2007	2008	2009	2010	2011	2012	Total
Donors	12	14	24	17	21	21	27	32	168
Private	5	2	5	1	1	4	2	2	22
GOG	-	-	-	-	-	-	-	-	0
Total	17	16	29	18	22	25	29	34	190

The non-availability or low level of funds from government (14% of total disbursement of government subvention in 2011) for research on priority needs of farmers that have been identified by the RELC is, therefore, compensated for by this aggressive engagement with donor-partners to leverage funds for contract research. This ability to leverage resources has enabled the institute to continue its research that is dictated by the donors, however, the institute has failed to access funds from the donor community for doing research on the several farmer-generated research topics that have been prioritized by the RELC. According to data gathered from the study only about 21% of the expected 90% of research proposals developed and implemented came from RELC recommended priorities. Under the conditions of inadequate funds from the government,

Recommendation: SARI requires assistance to develop a strategy for soliciting funds to work on the prioritized farmer-generated and RELC-prioritized research topics.

XIII. SARI'S POTENTIAL FOR RESEARCH AND TECHNOLOGY GENERATION AND TRANSFER

SARI's potential for research and technology generation and transfer could be estimated from an analysis of the extent to which the following requirements have been met by the institute:

- Staffing of critical research areas relevant to needs of stakeholders

  SARI has dedicated and willing researchers and support staff that are experienced in working with various stakeholders in the agricultural industry under less-than-perfect conditions. An examination of the current status of staffing in the various research areas indicate that most of the positions are staffed by qualified scientists who have demonstrated exemplary track records in their areas of expertise. There are some key staff positions for scientists in nematology, virology, weed science, cotton and horticulture/vegetables that have not yet been filled. SARI has a staff development plan in place through which staff required in various research areas are being trained at the MSc and PhD levels to take up some of the vacant positions in the institute.

  Recommendation: Under the current conditions of under-funding of the staff development plan, the institute needs capacity development assistance to ensure that it gets the full complement of qualified staff required for SARI to reach its potential for research, technology generation and transfer in the Northern regions.

- Housing, office and research infrastructure, equipment, laboratory supplies, and research fields.

  The state of housing and office infrastructure, facilities, supplies, logistics, land (in some cases) and various equipment are not up to the standards required to engender the conduct of unimpeded first class research, neither does it provide motivation to the scientists to undertake their work without undue stress. The state of SARI's infrastructure and facilities is recorded in Appendix 4.

- Funds for research

  Although SARI receives funds tied to special projects from several donor-sources, funds dedicated for research into client-driven priorities that have been generated from the field through interaction of farmers with the AEAs in the districts to the RELC are very low. Therefore, even though these needs are transmitted to the RELC offices in the regions and finally to SARI to be incorporated into their research plans for the year, the government subvention for research is negligible to enable these specific priority needs to be met.

  Recommendation: The advocacy role of the Council (CSIR) and the institute (SARI) appears to be weak. In order to increase the government's awareness and commitment to adequately fund research CSIR/SARI requires assistance to develop a strategy for establishing a strong advocacy front to cause government to see that improving the efficiency of agricultural production is a key to pro-poor economic growth and improvements in agricultural technology are the principal means of doing this. The message should also stress the fact that although there is still widespread food insecurity in spite of the existence of the agricultural research stations, the situation without current technology development

would have been unimaginable. This is a key message that could be the advocacy theme of CSIR/SARI intended to provoke an increase the government's contribution to the research budget and increase SARI's potential to generate and disseminate research in the northern regions.

Recommendation: In order to deal with problem of research funding from government, the SARI's board and management need to find a way to secure more operations funding to improve infrastructure, equipment and general conditions of the institute. There are many innovative ways to do this including: getting companies to establish endowment funds for research chairs and creating a position for and hiring a fundraiser working full or part-time for the institute to bring in the required funds. Finally, as part of its strategy to attract research funds, the Board and management of SARI should also develop proposal to target partners-organizations that are will to support investments in infrastructure, equipment, specialized units/laboratories and other facilities which are currently inadequate or in disrepair.

- Existence of mechanisms for (a) coordinating the activities of researchers at SARI and users of the developed technologies, (b) collaborating with outside institutions and researchers to access needed/required technologies that can be adapted and adopted in Ghana and (c) stimulating dissemination and adoption of technologies:

  There already exist mechanisms for coordinating activities from the generation of research needs at the farmers' level as well as successful systems for collaboration with outside research and development institutions which increases the potential for SARI to develop and facilitate the dissemination of new technologies for adoption.

  Recommendation: Provision of support to SARI to effectively implement the RELC mechanism for generating and disseminating technologies would increase its potential in increasing both generation of client-driven technologies and their dissemination and adoption.

  The on-going collaborative activities with various private and public international organizations and research institutions have provided SARI with the opportunity to access, adopt and adapt needed technologies to solve local problems. The existence and use of a protocol for accessing germplasm, breeding and release of crop varieties shown below also demonstrate SARI's collaboration that stimulate the generation, adoption and dissemination of agricultural technologies.

  Recommendation: Successful collaborative activities lend themselves to scaling-up and donors should be made aware of the opportunities to invest in these high impact projects that would increase the productivity of farmers in the northern regions

- The location of the institute in the area of need, where its core clients are and the singular focus on research on Northern region crops and production and post harvest problems and relationship with MoFA.

  SARI is located in the heart of the northern regions and operates several outstations in the each of the 3 regions representing the various farming systems and works closely with MoFA (the regional RELC office is headed by a SARI scientist).The institute is, therefore, in a good position to understand the research needs and priorities of farmers and other private sector actors in the various value chains. Opportunities exist for the design of a program aimed at assisting SARI to improve on the efficiency of the systems for generating and disseminating technologies is improved, the overall potential of SARI would further increase considerably.

- SARI's Strengths, Weaknesses, Opportunities and Threats (SWOT).

  A SWOT analysis of SARI demonstrates that the institute has many strengths and opportunities which could also be improved further. The organization is also beset by many weaknesses that negatively affect its ability to reach its potential of fulfilling its mission of serving the interests of the farmers in the northern regions. The weaknesses section lists the various areas that lend themselves to institutional capacity strengthening assistance programs:

TABLE 3: SWOT ANALYSIS

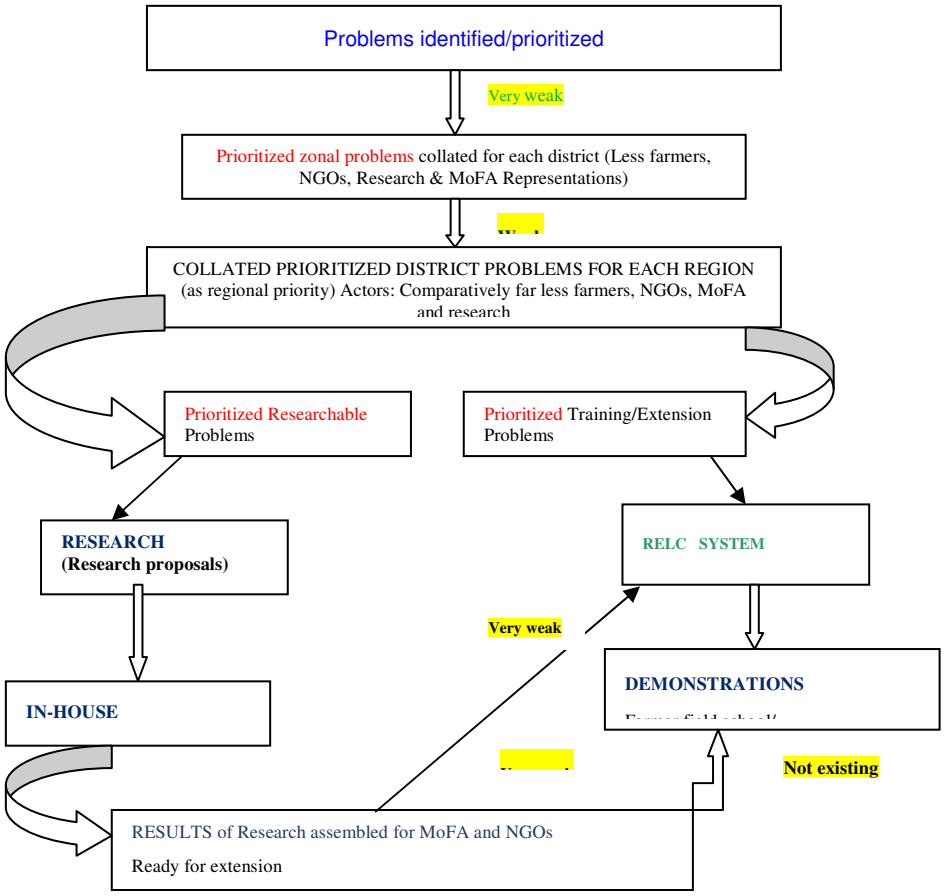
Strengths	**Weaknesses**
• Highly qualified research personnel • Has operational substations in each of the 3 regions • Available land resources in most of the stations and substations • Basic required physical infrastructure at the regional stations. • Has several collaborators and partners for funding and implementation of programs • Ability to attract funding through the writing of winning proposals • Understanding of the problems and research needs of the northern regions • Existence of mechanisms for (a) coordinating the activities of researchers at SARI and users of the developed technologies, (b) collaborating with outside institutions and researchers to access needed/required technologies that can be adapted and adopted in Ghana and (c) stimulating dissemination and adoption of technologies.	• Difficulty in training and upgrading human resources due to lack of funds • Inadequate modern research facilities and logistics e.g. Biotech and nutrition laboratories, field equipment and machinery, screen house, insect breeding structures, glass houses, cold room for seeds and research material and drying and threshing platforms etc. • Lack of proper documentation of research land and properties • Lack of fencing for critical research fields to secure experimental fields • Poor data management and ICT infrastructure and skills and lack of biometric unit • Inadequate accommodation, office space, stores, training and publicity facilities • Poor and inadequate of irrigation facilities for research activities in the dry season • Existence of various mechanisms for coordinating research activities, etc which constitutes a strength but weak implementation strategies
Opportunities	**Threats**
• SARI is strategically positioned to work on various crops and in various agro-ecological zones. • The institute has the ability to reach a large number of poor farmers with new technologies • Several young scientists are being groomed from other training institutions to complement and strengthen the key staffing positions • There are several experienced and well-endowed NGOs/PVOs that can be leveraged to partner with SARI to impact a large number of farmers	• Inadequate funds from Government of Ghana for research • Continuing encroachment on SARI's lands at some of the stations and substations • Possibilities of increased attrition rate due to poor remuneration and motivation. • Increased likelihood of destruction of on-station field trials by stray and herded animals • Sporadic ethnic conflicts, floods and droughts in the northern regions.

SARI has several strengths and opportunities to enable it position itself as a premier research institution serving the northern region and other arid areas in the West African sub-region. In spite of all the strengths there are various weaknesses and threats listed above that must be factored into the process of assisting it to increase its performance and reach its potential for research and technology generation and transfer.

XV. SARI'S LEVEL OF UNDERSTANDING OF THE RESEARCH AND TECHNOLOGY NEEDS OF ITS CORE CLIENTELE, THE FARMERS AND ITS ABILITY TO PRIORITIZE THE RESEARCH AGENDA BASED ON THE POTENTIAL OF PROPOSED RESEARCH THEMES TO INCREASE PRODUCTIVITY, FARM LEVEL INCOME AND OVERALL ECONOMIC GROWTH

There is an established methodology for the identification of problems, technology needs and research priorities of SARI's core clients, the farmers who are engaged in production in the various crop value chains. The methodology has been developed over a period of time to improve the efficiency of the Research Extension Liaison Committee (RELC) system that defines the research–extension linkages and how research and technology needs are identified and prioritized for researchers to work on. A selected scientist from SARI serves as the chairperson of this REL Committee in each of the three northern regions and he/she has an office in the Regional MoFA office to enable him/her to work directly with the MoFA staff who are in direct contact with the farmers at the district and zonal levels in identifying research needs of the farmers in the region. The scheme below details the process and demonstrates SARI's level of understanding of the research and technology needs. SARI is in the process of strengthening the identified weak links in the process.

Methodology to improve the efficiency of the RELC System for the adoption of technologies developed. (Generally, the program will adopt these steps and strengthen the weak linkages in the diagram presented below for efficient flow of technologies to farmers).



Although this mechanism exists, its operation shows several key weaknesses that negatively affect its implementation. Unless and until these areas of weakness (marked yellow) are strengthened, this, otherwise innovative system for generating and implementing the priority research needs of farmers in the regions would not produce the anticipated benefits.

Recommendation: There is the need to strengthen SARI's capacity to implement this system through the design of a technical assistance program to develop strategies for strengthening these weak links.

XVI. SARI'S ORGANIZATIONAL INTERDEPENDENCIES AND ITS EFFECT ON TRANSFORMATION

SARI has various partners with which it works on various projects to their mutual benefit. Some of the key organizations that have on-going research projects are listed below: USAID Ghana, International Institute of Tropical Agriculture (IITA), International Crop Research Institute for the Semi-Arid Tropics (ICRISAT), International Rice Research Institute (IRRI), Kwame Nkrumah University for Science and Technology (KNUST), GAABIC/IFDC/DANIDA/AGRA, University for Development Studies (UDS), ACDI/VOCA, N2 Africa, Brazilian Agricultural Research Cooperation (EMBRAPA), Crop Research Institute (CRI), Ministry of Food and Agriculture (MoFA), University of Florida, Gainesville, CIMMYT, Nestle Ghana &Nestle Cote d'Ivoire R&D Division, Cocoa Research Institute, Tafo, Kirk House UK, Alliance for Green Revolution in Africa (AGRA), GIZ (German), Ghana Broadcasting Corporation (Savanna Radio) and MoFA/JICA (Japanese).

Details of the key organizations identified and the projects they are engaged in with SARI are found in Appendix 5. SARI has gained a great deal of experience through its many associations and partnerships with various organizations. The institute has been involved in partnerships with the private sector, local, private and foreign research and educational institutions all of whom are passing on to it new skills and biotechnologies. SARI has also been collaborating with MoFA to enable it become more sensitive to the needs of farmers in the 3 regions. SARI would not be able to survive in its research activities without these partnerships since they are the main sources (86%) of the research funds it receives annually (taking year 2011 as an example). The inadequacy of core funding for research from the governments is also shaping the way the institute is responding to the research needs identified at the grass-roots level by its core-clients through the RELC system. The transformation required for SARI to fulfill its core function of serving the needs of farmers in the northern regions is being impeded by the current arrangements that predominantly serve the needs of its external funding partners and the researchers. The conduct of farmer-driven research must be the primary function of SARI which it is currently not performing to the best of its ability. The current situation needs to be reversed in favor of developing and implementing mainly, research proposals from the RELC.

XVII. SARI'S FLEXIBILITY IN OVERCOMING CULTURAL BARRIERS TO TRANSFORMATION

SARI recognizes the impact of negative social and cultural factors on the improvement of its research, development and dissemination of technologies and has set up the means to identify and deal with these barriers. All research activities in the institute are preceded by socio-economic studies to establish the relevance of the research program and the resultant technologies to the household/market. Development and resource economics research are also conducted at the institute to throw more light on socio-economic development pertinent to northern Ghana. In this regard, a thorough investigation is normally conducted, by a socio-economist of the institute. Analysis of the data collected on socio-cultural factors and the recommendations are used to guide the research efforts and ensure that the outcomes of the research do not impact negatively on its clients. Furthermore, outcomes of the research reveal the socio-cultural attributes that when adopted would support the dissemination and adoption of the developed technologies.

XVIII. THE IMPORTANCE OF SARI'S STATIONS AND SUBSTATIONS, THEIR CURRENT STATE AND JUSTIFICATION FOR THEIR REHABILITATION

SARI, in adopting the "farming systems" approach in delivering services to its clients, had to set up and operate stations and substations in each of the three regions with the assistance of the International Fund for Agricultural Development (IFAD). The operations are fashioned on a "hub and wheel" model in which each regional station has a number of satellite substations which are used as community-level research facilities. The placement of the substations in these strategic locations is to enable SARI to conduct trials that cover the various socio-economic, cultural, farming system, agro-ecology, rainfall and soils, as well as, the various crops that are grown in the northern regions.

The northern regions (Northern, Upper East and Upper West cover about 41% (97,702km2) of the land area of Ghana (237,626km2) and the soils, rainfall, climate and crops that are grown vary according to the region. Long distances separate the regions and districts and the most of the roads are deplorable, making trekking by research scientists to research sites very difficult and inefficient. SARI's work involves the testing of various varieties of crops and technologies in multiple and representative locations for the provision of specific recommendations on crops and production technologies suited to each area and also the setting up and maintaining adaptive trials and demonstrations of new improved technologies where their users live and farm. Based upon these observations, IFAD financed the development of infrastructure in some of the strategic locations that had peculiar crops, agro-climatic conditions and farming systems. It has been a vision of SARI to develop a substation in each district of the northern regions because of the sheer size and variable conditions in each region. By the end of the IFAD project, not all the planned substations were constructed. Furthermore, as at the time of the visit of this Team to each of these stations, most of the infrastructure and facilities are totally broken down or are in a deplorable state. The important role that these substations play in the overall testing of varieties and other location-specific technologies makes it imperative for the institute not only to maintain but to establish more of these substations that were not included during the IFAD period. In general, the infrastructure and facilities are in various states of disrepair and disuse which definitely affect the quality of research that is conducted and something needs to be done about the current situation. A detailed list of SARI's stations and substations and description of their current state is found in Appendix 6.

Recommendation: There is a need for SARI to negotiate with government and develop a plan for rehabilitating the substations and developing new essential ones required to strengthen the institute's capability in doing research in the various ecological and soil zones.

XIX. REQUIREMENTS FOR SARI TO ACHIEVE THE STATUS OF AN AGRICULTURAL RESEARCH CENTER OF EXCELLENCE TO SERVE AS A MODEL IN WEST AFRICA

SARI, being positioned with a clear mandate as the key research institution catering for the research needs of the northern regions of Ghana, is expected to have a Center of Excellence to distill and disseminate research industry best practice. Having a Center of Excellence would significantly enhance the ability of SARI to meet or exceed the goals that it supports.

A **center of excellence** refers to a team, a shared facility or an entity that provides leadership, evangelization, best practices, research, support and/or training for a focus area. The focus area in this case might be a technology, a business concept, a skill or a broad area of study. A center of excellence may also be aimed at revitalizing stalled initiatives (Mark O. George (2010). *The lean six sigma guide to doing more with less*. John Wiley and Sons. p. 261).Within an organization, a center of excellence may refer to a group of people, a department or a shared facility. It may also be known as a **competency center** or a **capability center**. The term may also refer to a network of institutions collaborating with each other to pursue excellence in a particular area (Tarek M. Khalil; L. A. Lefebvre; Robert McSpadden Mason (13 August 2001). *Management of technology: the key to prosperity in the third millennium: selected papers from the ninth International Conference on Management of Technology*. Emerald Group Publishing. pp. 164–). *In the case of SARI, a research Center of Excellence (CoE) consists of a team in the institute that will champion or facilitate the development of systems required for high quality research.* This team shares a common idea or vision and an overall and clearly defined set of research objectives. In this instance, the team positions the research agenda within SARI, supports that research agenda and finally, acts as a link between the constituents/stakeholders and the institute.

In trying to find out the readiness of SARI to set up a center of excellence, it is important to know its present level of maturity in conducting research. Organizational Maturity Models are a good approximation to the stages organizations will experience in creating CoEs. One of these models used here is the Capability Maturity Model (CMM). The CMM model identifies five increasing levels of maturity for an organization:

1. Initial (chaotic, informal, ad hoc, heroic) the starting point for use of a new process.

2. Repeatable (managed, documented, process discipline) the process is used repeatedly.

3. Defined (institutionalized, integrated) the process is defined/confirmed as a standard business process.

4. Managed (strategic, quantified) best practices are shared and process management and measurement takes place.

5. Optimized (continuous improvement) includes deliberate and continuous process optimization/improvement. *(Adopted from Wikipedia Capability_Maturity_Model)*

From our analysis, SARI is at level 3 where their processes for doing research are defined as a standard business process, and that means SARI has done well to an extent, however, it has more work to do if it is to establish a CoE. For SARI to be recognized as a research organization with a CoE, it must fulfill several conditions including the following:

- Create a team in the institute to provide research guidance (such as the existing Scientific Support Group)
- Become a joint physical community facilitating a larger degree of daily interaction
- Have leaders who must be outstanding researchers and visionary leaders. (good leadership is a prerequisite for excellent results within a CoE)
- Serve as a hub for exceptional research
- Be an international training site (provide optimal environment for training of the next generation of first rate scientists)
- Set standards for how exceptional research should be conducted
- Foster research training linkage with education
- Orient to the international research community and collaborate with international institutions and include researchers from abroad (attract recognized rising talent)
- Engender transparency of scientific technology information for the international community
- Make necessary structural changes to produce high technological and science intensive production with high added value
- Implement Good Scientific Practice and Good Laboratory Practice
- Make scientific-research report standards equal to international research and management standards.
- Research must meet the needs of its core clientele, the farmers.

Several of these requirements have been met by SARI to some extent. Incidentally, these capacities can be developed and/or strengthened when the goal to do so is set and a timetable, indicators and targets are developed. These and other requirements for the establishment a CoE are not beyond the management of the institute and its scientists to meet when a commitment if made to do so. The establishment of a CoE also comes with a cost (time, money, tools, kits, training, mentoring) to be productive and for the organization to measure success in terms of quality of research and staff and clients' satisfaction. There are consulting companies that provide guidance in the establishment of a CoE which could be commissioned to provide this service.

Apart from these soft skill and processes that need to be developed, there are also several issues associated with infrastructure, research facilities, equipment, logistics and other support services that need

to be addressed to complement the efforts in developing the soft skills. Without the basic infrastructure, tools, facilities and other identified key needs required for doing first class research and fulfilling the conditions of a congenial environment that will stimulate the conduct of first class research, all the other efforts to establish SARI as a research center of excellence would be difficult to achieve.

Recommendation: What is needed to start the process of establishing a Center of Excellence at SARI is for the institute to seek a financial and technical assistance to enable it deal with the most basic identified needs as one of the first steps in SARI's pursuit to attain a CoE status.

XXI. SIMILARITY OF FINDINGS TO THOSE OF PREVIOUS ASSESSMENTS OF SARI

There have been two previous assessments of SARI, one commissioned by SARI itself in 2005 and another rapid one undertaken by a USAID in-house team, which provided preliminary insights into the operations of the institution.

A. SARI ASSESSMENT AND STRATEGIC PLANNING PROCESS (AUGUST 2005)

SARI engaged the services of an external consultant, Nkum Associates, to carry out an assessment of its internal systems including working relationships, decision-making procedures and implementation strategies as well as its relationship with clients and stakeholders in 2005. Some of the findings of the assessment are as follows: poor and inadequate accommodation and research infrastructure, inadequate state-of-the-art equipment, limited commercialization activities to generate funds and poor reward and incentive-packages for staff. Other areas of need identified include the following:

1. Clarification of corporate identity and image of SARI (Re-definition of vision and mission statements, Outline core values)
2. Re-orientation of staff and HRD (Strategies for attitudinal shifts, Leadership, Financial Management and People Management skills training, Upgrading of technical skills, Promotion, Incentive Packages)
3. Infrastructure development and re-tooling (Modern lab equipment e.g. biotechnology, Residential facilities, Utility supply – electricity, water etc.)
4. Market orientation of research and other services (Review of farming system concept, Relationship building with stakeholders e.g. industrialists, Making research respond to needs of clients, Marketing and promotion of services and products, Developing income generation ventures
5. Strengthening of organizational structures and processes for enhancing service delivery (Joint planning, Co-ordination, Supervision, Communication, Monitoring and Evaluation, Feedback Systems)

B. USAID RAPID ASSESSMENT (APRIL 2012)

A USAID Ghana team visited CSIR-SARI in northern Ghana between April 22-26, 2012, as part of the project design activities of the Agriculture Technology Transfer and Policy Reform Projects, to gain better understanding of the mandate of CSIR-SARI and its outstations and to have firsthand information on the state of the research institute. The Team concluded, after the visits, that although SARI has been successful in cooperating and collaborating with international agricultural research centers and funding from development partners, foreign universities and other local programs, the institute and its outstations are currently facing serious challenges relating to infrastructure, research equipment and supplies, logistics and internet connectivity and breeders to serve as replacements for those due to retire and for filling vacant research positions for some selected crops. It was also clear to the team that although SARI

has done a lot of work for agricultural research and development especially for the savannah regions of Ghana, the dissemination of key information is hugely lacking due to the absence of ICT facilities.

The problems facing SARI that were identified in the present assessment are, to a large extent, similar to those identified in the two cited assessments. The needs of the institute are unfortunately, still relevant today and require planning and technical and financial assistance to get it to transform itself into the envisioned role of providing leadership in technology generation and dissemination in the Northern regions of Ghana.

XX. RECOMMENDATIONS

Many challenges and recommendations have been presented already in previous sections of this report. This section below organizes and summarizes the key ones. The recommendations propose solutions not only to SARI's management team, board of governors, and the Government of Ghana, but also to development partners, local and international research institutes and organizations, especially those interested in partnering with SARI to help them overcome their capacity development, infrastructure, and equipment challenges.

1. CAPACITY BUILDING TRAINING TO IMPROVE GOVERNANCE OF SARI

1.1. BOARD OF DIRECTORS

The composition of the board of directors does not yet reflect the target constituents. The current board membership includes a banker, deputy director-general, R&D, cognate director (CSIR-Animal Research Institute (ARI) Director), MoFA and a private farmer, but lacks gender balance, and representation from agribusiness firms and NGO/PVO. Moreover, the Board has not been effective in mobilizing additional resources from government or successful in ensuring that donor funding aligns with the stated mission of SARI. For these reasons, many of SARI's fundamental needs remain unmet year after year.

Recommendations: SARI should initiate a process to reorganize and to expand the composition of the Board to establish a good balance in representation. Furthermore, SARI should seek assistance to strengthen the capacity of the Board in areas of board governance, advocacy, fund raising and budgeting. These interventions could enable the Board to effectively drive changes that could lead to the harmonization of the institute's mission with the identified needs of the farmers in the northern region.

1.2 LEADERSHIP

SARI's Board and management team have not succeeded in driving the institute to achieve its mission. For example, farmer-client needs and challenges do not inform the majority of research conducted at the institute. In addition, SARI lacks the infrastructure, equipment and facilities required to support top notch research projects.

Recommendations: Leadership and performance based management training courses should be offered to staff to enhance the performance of SARI Board and management team. This would help sharpen the skills of the team and lead to the development and implementation of a performance-based management system at the institute that would track and measure the performance of researchers and other staff vis-a-vis the goal and objectives of the institute.

1.3 CONSTITUENCY

SARI senior staff and its media practitioners came to a general consensus and agreement on the inadequacy of the current communication mechanisms/processes to reach out to constituents. The group agreed that SARI's weak advocacy skills needed to be strengthened in order for the institute to lobby effectively on behalf of its constituents.

Recommendation: SARI requires technical assistance to strengthen its communication processes to make it more visible to the public. This should include the development of a communications strategy, the set-

up of a public relations unit, and the design of a website to market the institute. The establishment of an advocacy skills capacity strengthening program could also remedy the current situation of poor constituency relations.

2. MANAGEMENT PRACTICES

2.1 PLANNING

SARI staff lack capacity in planning, M&E and database management.

Recommendation: SARI requires a capacity strengthening program to develop and sharpen the skills and competences of key staff in the areas of Monitoring and Evaluation (M&E), Results-Based Management and Data-base Management. They would also require some technical assistance to develop an M&E plan, data gathering tools and a program indicator tracking table to monitor the performance of indicators specified in the institute's Log Frame. This would enable staff to observe at a glance the performance of each indicator and better inform management decisions.

2.2 PROGRAM DEVELOPMENT AND IMPLEMENTATION

The Research Extension Linkages Committee (RELC) lacks the systems and mechanisms for identifying, consolidating and prioritizing farmers' research requirements and disseminating new research findings and technologies to farmers.

Recommendations: SARI in collaboration with MOFA should develop an appropriate system and strategies to package and disseminate research findings so that the system becomes workable and effective.

A technical assistance package aimed at strengthening these critical but weak research-extension linkages would help ensure effective development and dissemination of technologies by the institute.

2.3 ADMINISTRATIVE PROCEDURES

SARI has a functional administrative department headed by an Administrator who oversees operations. The department manages human resources, travel, finances and performs other administration functions. Although an Administrative Manual exists, overall the administrative systems in place remain inadequate to manage a growing organization.

Recommendations: The introduction of a Management Information System (MIS) would help streamline procedures and make the department more efficient. In addition, SARI staff would require training on US government financial and procurement rules, regulations and reporting systems if they receive a substantial amount of funding from USAID.

2.4 INDEPENDENT RESEARCH CONTRACTS

Some SARI scientists receive independent research contracts without implicating the institute. They often work on research projects not officially mandated and/or approved by the institute. The team found that the institute lacked a comprehensive and formal institutional-level agreement and policy on this issue.

Recommendations: SARI management should develop rules and procedures and MOUs that outline rules of engagement of staff in independent research. This practice should not be encouraged so as to ensure that the institute becomes an integral part of any agreements, benefits and receives the recognition for all research work.

3. HUMAN RESOURCE MANAGEMENT

3.1 HUMAN RESOURCE DEVELOPMENT

Many research staff positions remain vacant. They need to be filled in order for the institute to get the full complement of research personnel required to fulfill its mission. The management and staff provided a list of short-term and medium to long-term training capacity needs which they used to develop a prioritized staff training and capacity development plan.

Recommendations: SARI should fill vacant positions immediately and seek assistance to implement their capacity development plan. This will enable SARI to reach its potential for research, technology generation and transfer in the northern regions. SARI should explore opportunities and enter into negotiations with various training institutions and agencies who can deliver capacity development programs to their staff.

4. SERVICE DELIVERY

4.1 MEASURING IMPACTS

An impact evaluation of SARI's research programs has not been performed for a long time. This activity would provide an objective and credible assessment of its performance in delivering on its core mission and how its programs impact the livelihood of farmers in the northern region.

Recommendation: SARI should acquire technical assistance and support to develop the terms of reference and to contract an external team to conduct an impact evaluation of its programs immediately.

5. EXTERNAL RELATIONS

5.1 INTER-ORGANIZATION COLLABORATION

SARI has successfully collaborated with many organizations, however, more opportunities exist for maximizing the potential benefits of inter-organization exchanges and partnerships.

Recommendations: SARI and its constituents should seek training or technical assistance on how to build partnerships and strengthen collaboration. This could lead to stronger and more fruitful collaboration and could expand SARI's capacity in technology generation and dissemination

5.2 PUBLIC AND MEDIA RELATIONS

The organization lacks a public and media relations plan and an adequate communication strategy to reach out to the public and its key constituents.

Recommendation: SARI should seek technical and financial assistance to develop a public relations and communication plans so that it has an effective strategy to engage with its key stakeholders. This would enable them to disseminate information, to show case their results and achievements as well as to garner support for their programs.

6. SUSTAINABILITY

6.1 DEVELOPMENT OF COMMERCIALIZATION STRATEGIES

SARI's commercialization activities account for only about 2% of its internally generated funds (IGF). The institute has not exploited the opportunities that exist to generate alternatives sources of income.

SARI has several assets that could be managed and put to use in generating income for the institute. For example, the new Seed Law permits qualified organizations to produce and market certified seeds. SARI has land and basic infrastructure and equipment that could be used to create a profitable commercial certified seed production enterprise.

Recommendation: SARI should seek technical support to develop a business plan for the commercialization of its products and services. This plan should include a technical assistance component that will strengthen SARI's capacity to develop and implement strategies for promoting and marketing its services and products. This would open up more opportunities for the institute to serve the interests of its diverse stakeholders in addition to generating income from contracts with large external donors.

7. FUNDING OF FARMER-CLIENT-DRIVEN RESEARCH

SARI receives a substantial amount of funding for specific research activities dictated by the terms of each donor contract. These research contracts do not always align with farmers/clients research priorities. Only14% of the total of SARI's government subvention remains for research after the payment of salaries and other recurrent costs. This makes it difficult for the institute to conduct the required farmer-client-driven research. This situation has persisted for a long time and does not seem to be a priority area for the government.

Recommendation: While negotiations are initiated with government to provided the needed research funds, there are opportunities for development partners and donors to consider funding specific prioritized research needs generated at the RELC level that do not receive adequate GoG funding. This would enable the conduct of client-driven research intended to bring solutions and technologies needed by farmers.

8. RE-ORIENTATION OF SARI TO SUPPORT PRIVATE SECTOR-DRIVEN RESEARCH AND TECHNOLOGY GENERATION

Private sector engagement has frequently been identified as a key component in moving forward technology generation and dissemination. The institute has inadequately exploited the full potential of SARI's scientists and re-oriented them to foster private-sector-driven research and technology generation to meet the needs of its core clientele.

Recommendations: To solve this problem SARI requires a great deal of technical assistance and should do the following:

i. Establish fee-for service mechanisms in collaboration with the private sector in order to make the services it provides more sustainable.

ii. Publicize the willingness and capabilities of SARI in providing answers to various research problems through various multi-media channels.

iii. Get more involved in the activities and operations of various partners to help them identify their research needs which the institution or any of its local and international partners could provide answers to.

iv. Find creative approaches to encourage the private sector to participate and invest in activities that drive technology generation and dissemination such as assisting the private sector firms to innovate, reduce costs and provide better quality goods and services to the agricultural industry.

v. Spearhead the development of laws to protect intellectual property rights of scientists to escape plagiarism and stealing of scientific idea;

vi. Engage the private sector in the development and delivery of a skills strategy, including training provision.

vii. Re-orient research to competitive products on the scientific markets.

SARI should work on these approaches and determine which of them could be adopted and implemented in the short, medium and long term.

9. SCALING-UP OF SUCCESSFUL PROJECTS IN TECHNOLOGY GENERATION AND DISSEMINATION

SARI has demonstrated its ability to support and advance some private-sector-led agricultural technology generation dissemination. Several possibilities exist for scaling-up some of the projects. Successful collaborative activities resulting in the generation and dissemination of new high impact technologies such as those engaged in by SARI with various local and international institutions lend themselves to expansion and scaling-up to benefit more farmers.

Recommendations: SARI should make donors and other development partners aware of the opportunities to invest in these high impact projects that would increase the productivity of farmers in the northern regions by developing technical assistance programs to share with interested organizations willing to fund such projects.

10. INTRODUCTION OF BIOTECHNOLOGY, CLIMATE CHANGE, NUTRITION AND ICT UNITS IN SARI'S RESEARCH AND DEVELOPMENT PROGRAMS

SARI lacks several specialized units and facilities such Biotechnology, Climate Change, Nutrition and Information Communication Technology (ICT) that would enable SARI's scientists to perform their work better.

Recommendation: Biotechnology, climate change, nutrition and Information Communication Technology (ICT) offer enormous opportunities to create rapid change and impact in agricultural research and development. The Institute would require technical assistance to develop a plan for equipping its nascent biotechnology facilities, climate change, and Nutrition and ICT units. To achieve this they will need to develop a fundraising plan for soliciting public support and funds.

11. FUNDING FOR DEVELOPMENT OF INFRASTRUCTURE AND OTHER RESEARCH FACILITIES

The assessment team found that one of the main constraints to progress in conducting first-class research remains the lack of commitment and/or inability of the Government and SARI board and management to build the infrastructure required to advance the research agenda of SARI.

If the institute wants to attract client-driven research funds to meet the needs of agribusinesses in the northern regions and also, to establish a center of excellence, it will need to upgrade its infrastructure and facilities. The inability of SARI to generate adequate funds for maintenance and refurbishment of its

facilities, the encroachment of people on its properties, the lack of ownership documents on properties inherited from MoFA, and the many tribal conflicts that have continued to plague many areas of the northern regions which have resulted in the pillaging and destruction of SARI properties, have all contributed to the deterioration of SARI's infrastructure and image. The poor and deplorable state of these assets exerts a negative impact on the work of SARI and needs to be remedied. Appendix 6 lists SARI's infrastructure and facilities needs.

Recommendations: In order to deal with problem of inadequate funding from government, the SARI's board and management require assistance to develop strategies to secure more operations funding from both government, the private sector and other development partners as well as internally-generated funds to improve infrastructure, equipment and the general conditions of the institute. Options available include getting companies to endow research chairs and hire a full or part-time fundraiser to raise funds for various causes at the institute and other strategies.

12. ESTABLISHMENT OF A CENTER OF EXCELLENCE AT SARI

The assessment team observed that several of the skills and capacity requirements for the establishment of a Center of excellence have been met by SARI. Those deficient areas could be developed and/or strengthened with external technical assistance and support and with the commitment of the management team.

Recommendation: To start the process of establishing a Center of Excellence at SARI, the board and management should seek financial and technical assistance to develop a plan and budget.

SUGGESTED PRIORITY-RECIOMMENDATIONS FOR CONSIDERATION BY USAID

Among the various recommendations that have been made above, a number of them that require immediate attention have been prioritized and listed below for consideration by USAID. These recommendations include the following:

a) Capacity building training to improve governance of SARI (recommendations 1.1 - 1.3).

b) Capacity building training to improve management practices of SARI (recommendations 2.1 & 2.3).

c) Support for implementation of SARI's staff capacity development plan (recommendation 3.1).

d) Capacity building requirements to increase service delivery of SARI (recommendation 4.1).

e) Capacity strengthening of SARI business development unit for development of commercialization strategies to ensure sustainability (recommendation 6.1).

f) Introduction of Biotechnology, climate change, nutrition and ICT units in SARI's research and development programs (recommendation 10).

g) Funding for development of critical infrastructure and facilities required for the conduct of first-class research by SARI scientists (recommendation 11).

h) Establishment of a Center of Excellence at SARI (recommendation 12).

XXI. APPENDIX

APPENDIX 1: DRAFT USAID/GHANA INSTITUTIONAL ASSESSMENT FOR CSIR-SARI SCOPE OF WORK

I. INTRODUCTION

To implement the new Feed the Future (FTF) Initiative, USAID/Ghana is undertaking a series of assessments to assist in finalizing the Mission's approach in relation to the FtF results framework for the Ghana Multi-Year Strategy especially on intermediate results (IR) 1.1 (increased agriculture productivity and 1.3 (improved enabling environment for private sector investment). As part of this larger review, USAID/Ghana is analyzing the capacity of some national organizations that will most likely collaborate on some of the activities included in this strategy. The Savannah Agriculture Research Institute – Tamale is expected to be a main Mission partner for advancing Ghana's research agenda for key staple crops in the north. Therefore, USAID/Ghana is proposing to conduct an institutional assessment of SARI to determine effective means for collaboration.

II. CSIR-SARI SCOPE OF WORK

The Savanna Agricultural Research Institute (SARI) is one of the 13 research institutes that make up the Council for Scientific and Industrial Research (CSIR) – a quasi-government organization that operates under the ambit of the Ministry of Environment, Science and Technology. The Institute was originally known as the Nyankpala Agricultural Experiment Station (NAES). In June 1994, it was upgraded to a full-fledged Institute and re-named Savanna Agricultural Research Institute.

The mandate of the institute is to conduct research into food and fiber crop farming in Northern Ghana (Northern, Upper East and Upper West Regions) for the purpose of introducing improved technologies to enhance agricultural productivity. The crops covered in its research mandate include sorghum, millet, rice, maize, fonio, cowpea, groundnut, soybean, bambara groundnut, pigeon pea, yam, cassava, sweet and frafra potatoes, cotton and vegetables.

SARI's vision is to "Become a lead research and development (R&D) Institution by making agricultural research responsive to farmer needs and national development". And it's Mission is to "Conduct agricultural research in Northern Ghana with the aim of developing and introducing improved technologies that will enhance overall farm level productivity for improved livelihoods".

Purpose of the Assessment

The purpose of the assessment is to critically evaluate SARI's institutional capacity and the extent to which SARI is achieving its mandate. This should include a review of national polices relevant to agricultural research and the policies, practices and research protocols of the Council for Scientific and Industrial Research (CSIR) and their impact on SARI's effectiveness and overall growth in agricultural productivity in its zone of influence.

The assessment should analyze SARI's ability to support and advance private sector led agriculture technology generation and dissemination. This should include a review of the ability and willingness of SARI to identify, adapt and promote promising technologies from outside centers of expertise. It will also assess the ability of SARI to leverage resources from development partners and the private sector

achieve the status of a center of excellence as a National Agriculture Research Institute (NAR) serving as a model in agricultural research institute in West Africa.

This will include reviewing the following:

- Any previous assessments of SARI
- Current status in terms of core competencies in meeting and sustaining core mandate
- Capabilities for Research and Technology generation and transfer/dissemination
- Potential for Research and Technology generation and transfer/dissemination
- Level of understanding of the research and technology needs of its core clientele Potential for re-orientation toward private sector driven research and technology generation
- Ability to prioritize the research agenda based on the potential of proposed research themes to increase productivity, farm level income and overall economic growth
- Capability in advocating and proactively introducing new technologies including biotechnology in its research and development programs
- Organizational interdependencies and its effects on transformation
- Its flexibility in overcoming cultural impediments to transformation
- Extent of leveraging resources from multilateral -donors and public and private partners

Methodology

The institutional assessment of SARI is in respect of its capabilities as a National Agricultural Research institute positioned in such a way as not only to fulfill its core mandate in research, technology generation, adaptation and transfer but also to transform itself to meet the challenges of agricultural commercialization through greater private sector involvement in the context of science and technology applied in economic transformation. The specific requirements for the team assigned to assess SARI are:

1. Critically review and analyze relevant existing documents including the program description, work plans, annual reports, audit reports, etc. with the aim of determining the following:
    - scientific research and development capacities of SARI in particular and CSIR in general
    - gaps in the capacity (both human and infrastructure) of SARI for technology generation and dissemination in the given ecological zone
    - windows for introducing transformational approaches for agricultural research and development
    - leverages for sustainably providing research and development services
2. Meet with relevant USAID staff in Accra, development partners as well as relevant MDAs (including CSIR HQ) for consultation: CSIR - SARI three key staff; Key partners such as the International Institute for Tropical Agriculture (IITA), Africa Rice Center (WARDA); Projects implementing organizations such as MiDA, IFDC, ACDI/VOCA; Farmer association/organizations and other.

Proposed Schedule – June 2012

The consultant will work with USAID/Ghana through Africa dLEAD and SARI in planning an appropriate work schedule including identifying relevant contacts. The consultant(s) will work in Accra, and Tamale and the other regions with substations.

May 14 – 17	Preparation and desk study
May 18	Briefing in with USAID, relevant MDAs, DPs
May – 28	Travel to Tamale for full assessment

Deliverables

Deliverables include a proposed work plan, including a list of proposed meetings; a debriefing at the end of the field visits; a draft report; and a final report. The final report will include at a minimum:

- Major findings, critical analysis of constraints facing CSIR - SARI as well as opportunities and on the role of Science and Technology (S&T) in enhancing agricultural productivity to improve food security and reducing poverty in Northern Ghana; and
- Recommendations including any institutional improvements which may be required for CSIR - SARI to effectively coordinate the S&T agenda in Ghana and Northern Ghana in particular with its various partners, particularly the private sector. This includes suggestions on whether the present mix of staff, their qualification, available equipment and working conditions are appropriate for CSIR - SARI to effectively fulfill its mandatory functions.

APPENDIX 3: REVIEW OF PERFORMANCE INDICATORS

	LOGFRAME: LONG TERM & SHORT TERM OBJECTIVES	KEY PERFORMANCE INDICATORS EXPECTED FROM 2005 TO 2012	ACHIEVEMENTS TO DATE BASED ON KEY PERFORMANCE INDICATORS FROM 2005 TO 2012	RANKING	MEANS OF VERIFICATION	REASON FOR NON-PERFORMANCE
A.MISSION STATEMENT (A1) Conduct agricultural research in Northern Ghana with the aim of developing and introducing improved technologies that will enhance overall farm level productivity for improved livelihoods.	(A1) At least one new technology /innovation with the potential to improve overall farm-level productivity introduced every year. (A2) At least 25% improvement in farm-level productivity of farmers using the developed technologies recorded in 2 years.	(A1) 8 (A2) 25%	(A1) 26 new tecnologies (A2) 10-25%	(A1) 225% increase in expectation. PERFORMANCE EXCEEDED EXPECTATION (A2) Expectation achieved. PERFORMANCE ACHIEVED	SARI In-house Review. SARI Annual report, ERI Project report, AGRASHO Report	
DEVELOPMENT GOALS ***Long Term Goal (2006 – 2015*** (1) Capacity of staff to conduct and support appropriate research and development strengthened	(1a) At least 80% of established positions occupied by 2011 and 100% by 2015 (1b) 10 Journal papers produced by scientists annually (1c) 20conference technical papers	(1a) 80% (1b) 10 (1c) 20	(1a) 98% (1b) 10 (1c) 16	1a. 18% increase in expectation. PERFORMANCE EXCEEDED EXPECTATION (1b) Expectation achieved.. PERFORMANCE ACHIEVED (1c) 25% decrease in expectation PERFORMANCE BELOW EXPECTATION	SARI Directorate SARI Annual Report SARI Annual Report	

Short-Term Objectives (2006-2008) (1.1)Mechanism for orientating staff and incentive packages established (1.2)Staff skills to conduct and support R&D upgraded	produced by scientists annually (1.1a) A manual for orientation developed (1.1b) Appropriate incentive packages established (1.2a) 2 scientists and (1.2b) 3 support staff trained yearly	(1.1a) Yes (1.1b) Yes (1.2a) 3 (1.2b) 3	(1.1a) Yes (1.1b) Yes (1.2a) 5 (1.2b) 3	Expectation achieved Expectation achieved. (1.2a) 67% increase in expectation. PERFORMANCE EXCEEDED EXPECTATION. (1.2b) 0% increase. EXPECTATION ACHIEVED	Administration Report Directorate Administration Report Administration Report	
Long Term Goal (2006-2015) (2)Infrastructure and facilities to support research and development improved and maintained ***Short Term Objectives (2006-2008)*** Existing infrastructure and facilities rehabilitated and upgraded Modern infrastructure and facilities established and	(2a) Existing laboratories upgraded by 2010 (2b) A modern soil and plant laboratory established and functional by 2015 (2c)A modern biotechnology and seed laboratory established and operational by	(a) Yes (2b) Yes (2c) Yes (2.1) Yes (2.2) Yes	(2a) Yes (2b) Yes (2c) NO (2.1) Yes (2.2) No	Expectation achieved Expectation achieved Performance below expectation Expectation achieved	Soil Chemistry Laboratory Directorate Directorate Directorate	Lack of funds Lack of funds

functional Regular maintenance system for infrastructure and facilities established and operationalized. ***Long Term Goal (2006-2015)*** (3) Market and client-oriented sustainable research programs developed and implemented ***Short Term Objectives (2006-2008)*** Relationship with actors in agricultural development strengthened Appropriate technologies based on client needs developed Research on high-value commodity technologies conducted Research findings appropriately packaged for end-users	2010 (2.1) Comprehensive inventory /list on state of infrastructure and facilities in place by the end of 1st Quarter of 2006 (2.2) Prioritized list of required equipment drawn up and distributed to relevant stake-holders by end of 1st Quarter 2006 (2.3)Maintenance schedule at divisional level drawn up and operationalized by 2nd Quarter of 2006 (3a) 90% of research proposals developed & implemented emanate from RELC planning activities (3b) At least 5 contract research programs signed by 2015 (3.1)At least 10 MOUs signed annually with different partners	(2.3) Yes (3a) 90% (3b) 5 by 2015 (3.1) 10 MOUsx8months (2005-2012=80 (3.2) 1x8=8 (3.3) one per year from 2006-2012=7 (3.4a) 21x8=168 (3.4b) 2x8=16	(2.3) No (3a) 21% (3b) 188 in 2012. (3.1) 188 (3.2) 16 (3.3) 9 (3.4a) 15 x8=120 (3.4b) 4x8=32	Expectation not achieved Expectation not achieved (3a) 69% decrease in expectation. PERFORMANCE BELOW EXPECTATION (3b)Increase of183 in contract research expectation. PERFORMANCE EXCEEDED EXPECTATION (3.1) Increase of 108 in MOUs or 135% increase in expectation. PERFORMANCE EXCEEDED EXPECTATION (3.2) 100% increase in expectation. PERFORMANCE EXCEEDED EXPECTATION (3.3) 28% increase in expectation. PERFORMANCE EXCEEDED EXPECTATION. (3.4) 40% decrease in expectation. PERFORMANCE FELL BELOW EXPECTATION.	Directorate Directorate WAAPP Report, FABS Report Directorate Directorate SARI In-house Review Report Directorate Projects Report Projects Report.	Lack of funds Lack of funds

	(3.2)At least one appropriate technology on client needs developed every year (3.3)At least one research project on a high-value commodity implemented by 2008 (3.4a)21 radio programmes on technologies transmitted annually (3.4b) 2 T.V. documentaries on research findings/technologies broadcast annually			100% increase in expectation. PERFORMANCE EXCEEDED EXPECTATION.		
Long Term Goal (2006-2015) Capacity of SARI to mobilise and manage resources for research activities enhanced ***Short Tem Objectives (2006-2008)*** Research outputs promoted and marketed	(4a) 20% increase in the number of collaborative research projects/MOUs signed by 2015 (4b At least 5% increase in IGF at the end of 2007 and 10% increase by the end of 2015	(4a) 20% (4b) 5% in 2007, 10% in 2015 (4.1a) Yes	(4a) 91% (4b) 54% in 2007; 80% in 2011 (4.1a) Yes	(4a) 79% increase in expectation. PERFORMANCE EXCEEDED EXPECTATION (4b) 49% increase in expectation in 2007; 75% increase in expectation in 2011. PERFORMANE EXCEEDED EXPECTATION IN 2007 and 2011	Directorate Finance Report	

Mobilization and management of funds from sources other than government enhanced (4,3) Image of SARI enhanced and promoted	(4.1a) A unit to efficiently manage resources established by the 3rd Quarter of 2006 (4.1b) At least 5 brochures and manuals developed and published annually (4.2a) Mobilized funds from non-governmental sources form at least 30% of government remitted funds by 2008 (4.2b) All accounts from non-governmental sources computerized with appropriate accounting software by 2nd Quarter of 2006 (4.2c) Monthly update of funds from non-governmental sources given to divisional heads (4.2d) At least 5% increase in MOUs and partnership	(4.1b) Yes (4.2a) Yes (4.2b) Yes (4.2c) Yes (4.2d) Yes (4.3) Yes	(4.1b) Yes (4.2a) No (4.2b) Yes (4.2ca) Yes (4.2d) Yes (4.3) Yes	. Expectation achieved Expectation achieved. Expectation not achieved Expectation achieved Expectation achieved Expectation achieved Expectation achieved	Expenditure control committee, CID oversight . Projects Report Financial Report Financial Report IMC Financial Report MOU documentation Ghana Web news report, Media Report	

	agreements on contract research signed annually At least 5% increase in positive news items on SARI in the media annually					
Long Term Goal (2006-2015) Organizational structures and processes for enhancing service delivery strengthened	(5b)A management board in place by 1st Quarter of 2006 (5b) A substantive Deputy Director appointed by mid 2006 (5c) Current organogram with Accounts under Administration to be maintained	(5a) Yes (5b) Yes (5c) Yes	(5a) No (5b) No (5c) No	**Expectation not achieved in 2006 but was achieved in 2007** **Expectation not achieved in 2006, but in 2007** **Expectation not achieved**	SARI Annual Report SARI Annual Report SARI Annual Report	Board was Inaugurated in 2007 Deputy Director Was appointed in July 2007 Accounts Division is a separate division from Administration
Short Term Objectives (2006-2008) Organizational structure of SARI reviewed and made functional Management systems and operational procedures streamlined and functional	(5.1) New organizational structure functional by the end of 2006 (5.2a) Two review meetings for monitoring and evaluation of service delivery held.	(5.1) Yes (5.2a) Yes (5.1) Yes	(5c) Yes (5.1) No (5.1) Yes	Expectation achieved Expectation not achieved Expectation achieved	SARI Annual Report SARI Annual Report SARI Annual Report	Lack of funding

	(5.2b) At least 90%of scheduled meetings held					

APPENDIX 4: INFRASTRUCTURE AND FACILITIES NEEDS

	ACTIVITIES (INFRASTRUCTURAL DEVELOPMENT)	BUDGET ($'000)			MEANS OF VERFICATION	ASSUMPTIONS
		2012	2013	2014		
3.0	Rehabilitate 4 bungalows at Wa	20	20	20	Handing over notes Physical inspection	USAID makes the necessary funds available
3.1	Rehabilitate 6 bungalows at Nyankpala	60	60	30	"	"
3.2	Provide 3 Junior staff quarters at Wa	25	45	-	"	"
3.3	Construct sheds, store room, drying platforms at Tumu, Wa and Babile	26	26	-	"	"
3.4	Rehabilitate 3 bungalows at Manga	25	25	25	"	"
3.5	Rehabilitate Guesthouse at Manga	20	20	-	"	"
3.6	Provide fencing for Manga Station	30	15	10	"	"
3.7	Rehabilitate 4 Junior Staff quarters at Damongo	20	20	-	"	"
3.8	Rehabilitate 2 offices at Damongo	10	10	-	Handing over notes Physical inspection	USAID makes the necessary funds available
3.9	Rehabilitate drying platform at Damongo	6	6	-	"	"
3.10	Construct 4 bed room Guesthouse at Damongo	25	25	-	"	"
3.11	Rehabilitate 36 labourers quarters at Nyankpala	60	40	-	"	"
3.12	Rehabilitate 24 Artisan and Junior Staff quarters at Nyankpala	80	40	-	"	"
3.13	Rehabilitate 7 Senior Staff bungalows at Nyankpala	70	60	60	"	"
3.14	Rehabilitate Administration and Laboratory blocks, Nyankpala	20	20	20	"	"
3.15	Construction of Office Accommodation for 5 offices, Nyankpala	150	150	100	Physical inspection Annual Report, Inventory of equipment	USAID makes the necessary funds available
3.16	Tarring of 40 km Internal Roads at Nyankpala	25	25	25	"	"
3.17	Provide Farm Equipment	40	40	40	"	"
3.18	Provide Laboratory equipment and chemicals	30	36	35	"	"
3.19	Provide Office equipment	31	41	49	"	"
3.20	Provide Furniture	12	15	20	"	"

	ACTIVITIES (INFRASTRUCTURAL DEVELOPMENT)	BUDGET ($'000)			MEANS OF VERFICATION	ASSUMPTIONS
		2012	2013	2014		
3.21	Provide vehicles and Motor cycles					
3.21.1	Provide Nissan Patrols (3)	240			"	"
3.21.2	Provide Toyota Pick-ups (7)	250			"	"
	Set up SARI website					
3.21.3	Provide Motor bikes (30)	90			"	"
TOTAL	1,059.00	899.00	629.00			TOTAL
GRAND TOTAL			2,587.00			GRAND TOTAL

INFRASTRUCTURAL DEVELOPMENT AT MANGA, UPPER EAST REGION

	ACTIVITIES	BUDGET ($'000)			MEANS OF VERFICATION	ASSUMPTIONS
		2012	2013	2014		
1	Rehabilitate 4 bungalows at Manga	15			Handing over notes Physical inspection	USAID makes the necessary funds available
2	Rehabilitate Guesthouse at Manga	15				
3	Construct 4 bungalows at Manga	80				
4	Construct 4 offices at Manga	80				
5	Provide water systems	20				
6	Provide conference hall	50				
7	Provide fencing for Manga Station	100				
8	Provide Toyota Pick-ups (2)	80				
9	LCD projector and screen	5				
10	Internet facilities	15				
11	Provide office furniture	10				
12	Provide air conditioners (10)	8				
13	Provide filing cabinets	5				
14	Provide screen house/insectary	20				
15	*Infra-red spectrometer*	30??				
16	*Flame photometer*	20				
17	*Chlorophyll meter*	7				
18	*pH meter*	5				
19	*Electronic scales (5)*	10				
20	*Texture analyzer*	10				
	Laboratory blender (3)	1				
21						
22	1m light measuring ceptometer	3 ??				
23	Freezers for storage of seed, soil and plant samples (3)	3				
24	Electronic Microscopes (2)	??				
25	GPS equipment (5)	3				
26	Gas chromatograph	???				

27	Hand held refractometer	2				
27	Titometer	1				
28	Soil and plant grinder	5				
	Total					

INFRASTRUCTURAL DEVELOPMENT AT WA, UPPER WEST REGION

	ACTIVITIES	BUDGET ($'000)			MEANS OF VERFICATION	ASSUMPTIONS
		2012	2013	2014		
1	Rehabilitate 4 bungalows at Wa	15			Handing over notes Physical inspection	USAID makes the necessary funds available
2	Acquire land for on-station research activities at Wa	7				
2	Provide 3 Junior staff quarters at Wa	60				
3	Construct sheds, store room, drying platforms at Tumu, Wa, Babille and Jirapa	50				
4	Rehabilitate 6 Junior Staff quarters at Wa, Babile, Tumu and Jirapa	90				
5	Rehabilitate Guesthouse at Wa	15				
6	Construct 3 bungalows at Wa	60				
7	Construct 4 offices at Wa	80				
8	Rehabilitate conference hall at Wa	20				
9	Provide fencing for Wa Station residential area	20				
10	Provide Toyota Pick-ups (3)	120				
11	LCD projector and screen	5				
12	Internet facilities	15				
13	Provide office furniture	10				
14	Provide air conditioners (10)	8				
15	Provide filing cabinets	5				
16	Provide screen house/insectary	20				
17	GPS equipment (5)	3				
18	Provide computers and printers (5)	8				
19	Provide photocopiers (2)	5				
20	Contruct drying platform and tarpaulins	10				
21	Provide tractor and its implements	30				
22	Provide threshers and shellers	10				
23	Provide Laboratory equipment and chemicals					
24	Infra-red spectrometer	30				
25	Flame photometer	20				
26	Chlorophyll meter	7				
27	pH meter	5				
28	Electronic weighing scales (5)	10				
29	Infra-red thermometer	0				
30	Laboratory blender (3)	1				
31	Fridges for storage of seed,	3				

	ACTIVITIES	BUDGET ($'000)			MEANS OF VERFICATION	ASSUMPTIONS
		2012	2013	2014		
	soil and plant samples (3)					
32	Electronic Microscopes (2)	10				
33	Grinding mill for soil and plant samples	8				
34	Muffle furnace					
35	Atomic absorption spectrophotometer (AAS)					
36	Desicators					
37	Multimix machine (with baffled milkshake cups)					
38	Hydrometers (digital)					
39	Block digestor					
40	Thermoters (digital)					
41	Pipette (digital) – 3ml, 10ml and 20ml					
42	Burrete (digital)					
43	Oven for drying soil and plant samples					
44	Dispensors and dilutors					
45	Stop watch					
46	Stirrers with magnetic stirring rods					
47	Hot plates					
48	Cylinders					
49	Volumetric flasks					
50	Measuring cylinders					
51	Round bottom flasks					
52	Beakers					
53	Test tubes					
54	Boiling tubes					
55	Quivette (10ml)					
56	Funnels					
57	Leaching tubes					
58	Porcelain crucibles					
59	Porcelain mortar and pestle					
60	Wash bottles					
61	Goggles					
62	Hand gloves					
63	Nose mask					
64	Lab coats					

APPENDIX 5: CSIR-SARI-TRAINING NEEDS

SHORT TERM COURSES	NUMBER	COMMENTS
Seed technology	12	
Laboratory technology for technicians	16	
Statistical computing for researchers	20	
Experimental design and layout for technicians	25	
Scientific writing for researchers	20	
How to write convincing proposal for funding	25	
Management for research projects	15	
Laboratory procedures for research scientists and technicians	20	
Visiting Research Scientists Program	30	5 persons/year
Human Resource Management	15	3 persons/year
International Workshops/ Conferences	25	5 persons/year
Training for Technical Staff (Technicians/Mechanics/Drivers)	25	5 persons/year
Medium to long term courses (2 for MSc and 3 yrs for PhD)		
Plant breeding and genetics	5	(MSc/PhD)
Plant physiology and crop production	1	
Soil nutrition and fertility management	1	
Soil chemistry/Soil Physics	1	
Agro meteorology, crop modeling and GIS	3	
Small farm equipment and mechanization	3	1/ regional groups
Plant Protection (Nematology/Pathology/Entomology)	3	
Biometry	1	
Accounts/Administration	4	
Post Harvest	1	
Librarian	1	
Food Nutritionist	2	
Seed technology	2	
Socio-Economics	2	
Rural Sociology	1	
ICT Specialists	3	1/regional groups

APPENDIX 6: SARI'S PARTNER-ORGANIZATIONS AND PROJECTS

ORGANIZATION	PROJECT
USAID-Ghana	Sustainable Intensification of Key Farming Systems in the Sudano-Sahelian Zone of West Africa: As part of the U.S. government's Feed the Future initiative to address global hunger and food security issues in sub-Saharan Africa, the U.S. Agency for International Development (USAID) is supporting multi-stakeholder agricultural research projects to sustainably intensify key African farming systems and as a way of bringing a regional focus to the CGIAR's Integrated Systems CRPs 1.1 and 1.2. The International Institute of Tropical Agriculture (IITA) is the lead institute for developing and implementing the Sudano-Sahelian zone project. SARI is the national research institute for the program. This research project focuses primarily on maize- and rice-production systems in Northern Ghana and sorghum-production systems in Southern Mali but is intended to result in spill-over effects in other similar agro-ecological zones.
International Institute of Tropical Agriculture (IITA)	Exchange of various crops germplasm and other technologies
International Crop Research Institute for the Semi-Arid Tropics (ICRISAT)	Semi-arid crops germplasm and other technologies exchange
International Rice Research Institute (IRRI)	Rice germplasm exchange
Kwame Nkrumah University of Science and Technology (KNUST)	Student attachment to SARI, collaboration among faculty and research scientists at SARI on various projects for exposure, sensitization and inspiration through meetings with various accomplished scientists at the institute
GAABIC/IFDC/DANIDA/AGRA	Partners with SARI and IFDC in the "Agricultural Value Chain Mentorship Project" funded by DANIDA through AGRA
University for Development Studies (UDS)	Collaboration on joint projects among faculty and research scientists at SARI and faculty of the Crops and Soil Science Departments of UDS. Student attachment to SARI on various projects for exposure, sensitization and inspiration through meetings with various accomplished scientists at the institute. Teaching and supervision of students' research by SARI scientists
ACDI/VOCA	Collaboration in setting up 20 demonstrations and promotion of use of cowpea nitrogen-fixing Rhizobium bacteria inoculants produced at SARI by mobilizing and linking its farmers to SARI to be trained in the use of Rhizobium inoculants usage, Testing of "mamaba" maize variety, Setting up 62 demonstration plots in Northern, UE and UW regions while SARI does soil tests at these locations.
Input Dealers and some farmers in the North	Receive samples of Rhizobium for on-farm trials
N2 Africa	Nitrogen fixing bacteria inoculation studies in the northern regions by SARI
Brazilian Agricultural Research Cooperation (EMBRAPA)	EMBRAPA has trained a SARI Scientist in Rhizobium inoculum production and has provided the bacteria cultures for production at SARI under the "Africa-Brazil Marketplace Innovation Project". On-station and on-farm replicated trials are being conducted upon which completion the inoculum would be supplied to input dealers for sale to farmers. Trials so far have demonstrated 100% increase in yield of cowpeas due to inoculation with Rhizobium "3267" and "3299" from this project
Crops Research Institute (CRI)	Many joint projects including WAPP (breeding and agronomy work) e.g. drought tolerant maize in Africa using similar materials. Currently conducting varietal trials across northern (covered by SARI) and southern sectors –up to the transitional zone, - Kintampo, covered by CRI). SARI conducts research at the CRI Biotechnology laboratory which is a center of excellence for researchers in the WA region
MoFA	Collaboration in conducting various trials and setting up demonstration plots,
University of Florida - Gainesville	Conduct of groundnut and other crops "modeling" studies with SARI scientists to develop prediction models to increase yield of various crops.

ORGANIZATION	PROJECT
CIMMYT	CIMMYT scientist have identified genes controlling drought tolerance, striga resistance, flood tolerance and quality protein in maize (bio-fortified) inbred lines and SARI scientists have received and are testing these inbred lines, doing selections and eventually releasing the promising lines to farmers. Currently, 4 varieties have been released and 8 more are earmarked to be released in due course.
Nestle Ghana and Nestle Cote d'Ivoire (Research and Development Division)	Partnership with SARI in an international biotechnology program: SARI is engaged in the testing of 3 pearl millet hybrids bio-fortified with iron (Fe) and zinc (Zn) for improved nutritional value.
Animal Research Institute (ARI)	An example of resource sharing between SARI and ARI occurred when GTZ resourced SARI and extended some of the resources to ARI. For example, ARI Director attended some training programs sponsored by GTZ in the Netherlands. IITA, SARI and ARI are collaborating in the VOLTA BASIN DEVELOPMENT CHALLENGE PROGRAM. ARI is the in-country partner with IRRI and SARI as partners. The ARI has posted a scientist at the SARI Wa station as part of the project. Other examples of collaborations: Cognate Directorship (sister institutions collaboration), Research Station collaboration: SARI-ARI-MOFA collaboration at Babile research station in the Upper West region.
Cocoa Research Institute – Tafo Ghana	SARI scientists collaborate on research using the biotechnology facilities of cocoa research Institute to identify genetic markers and to do gene introgression breeding work.
Kirk House Trust – UK	In its host-plant resistance work on cowpea, a SARI scientist had identified an aphid resistant cowpea and needed to use "introgression" (movement of a gene of one species into the gene pool of another through repeated backcrossing of an inter-specific hybrid) of the gene into the traditional varieties. The entomologist did not have the capacity, the facilities and supplies to do this work. Kirk House Trust signed a MoU with SARI and proceeded to offer training in molecular techniques to the SARI entomologist at the Cocoa Research Institute biotechnology laboratory which has been developed by Kirk House Trust. The laboratory also provided a DNA marker that could be used to identify the gene.
AGRA	There are various collaborative research projects namely: SARI AGRA SHP, SARI AGRA SOYBEAB, SARI AGRA COWPEA, that are being implement by SARI
GIZ (German Technical Assistance)	In a GIZ-funded project, SARI is conducting chili pepper germplasm trials in the Brong Ahafo and northern regions in association with CRI while GIZ is involved in bringing together the other chili pepper value chain actors to organize and assist value chain committees to develop Action Plans to increase their collaboration and performance. Pest problems are sent to SARI for solutions that are sent back to the farmers. SARI and UDs have also, developed training manuals and provided training for GIZ client-farmers. Starting July 2012, GIZ will be partnering with SARI to implement a Climate Change Adaptation Program to facilitate different adaptation strategies (soil and water management practices) in the northern and Brong Ahafo regions.
Ghana Broadcasting Corporation (Savanna Radio)	SARI maintains air-time with the station (6 slots are currently outstanding) to present its programs after which it receives feedback from farmers through the call-in facilities of the station
MoFA/JICA (Japanese)	SARI is working with the Sustainable Development of Rain-Fed Lowland Rice Production Project by supplying foundation seeds of rice for the planting of 60 plots (1 acre each) at model sites, while a Technical Management Committee provides technical assistance (fixing of bunds, production, processing and marketing). This project has resulted in the adoption of 23 technological packages and involved 674 farmers.

APPENDIX 7: SARI'S STATIONS AND SUBSTATIONS AND THEIR CURRENT STATE

	LOCATION	PECULIAR CHARACTERISTICS	INFRASTRUCTURE/ EQUIPMENT STATUS
Region: Northern	Nyankpala	• Represents the hub of the Northern region. It is a Guinea Savanna zone known for maize, cowpea, groundnut, rice and vegetable growing. More fertile soils compared to the Upper East or West regions. Availability of irrigation facilities in area. Has electricity, water, air and road travel facilities. Lots of NGOs and governmental support.	• Habitable staff Quarters/Offices. • Operational stores • Equipment partly in good Condition.
Substation	Damongo	• Covers two distinct agro-ecological zones--Transitional forest (towards the South) and Guinea Savanna (towards the North) with peculiar crops (Roots and tubers, cereal and legumes) that facilitate diversified research).	• One habitable building • More than 5 abandoned, • Dilapidated and uninhabitable • Buildings. • One Serviceable tractor/ • equipment
	Yendi	• Guinea Savanna zones with fertile soils. Less degraded soils. Major crops are Maize, Rice, Soya, Yam and vegetables. • Technology can be disseminated quickly to a large number of farmers. The structures at the site are dilapidated due to the Kokomba-Dagomba war from 1992 to 1994..	• More than 15 dilapidated, • Un-inhabitable and abandoned buildings. • No equipment
	Salaga (Libi)	• This area is a rice research and demonstration substation. Rice is the dominant crop grown in this area that is characterized by the large number of rice valleys.	• This is presently designated as a "learning center" and there is no officer resident there.
Region: Upper West	Wa	• Represents the hub of the Upper West region. • Guinea and Sudan Savanna zones that cuts across two agro-ecological zones that facilitates diversified savanna areas' research. The area has serious land degradation and water conservation problems (as one moves northwards). Endemic Striga infestation. The degraded soils facilitate soil fertility and soil carbon content or sequestration analysis. Major crops are cereals and legumes. Land	• Habitable staff quarters/offices • but need repairs an/maintenance • Meteorological station intact but no • personnel to manage the station.

	LOCATION	PECULIAR CHARACTERISTICS	INFRASTRUCTURE/ EQUIPMENT STATUS
		acquisition is a problem and encroachment is rampant. • Prevents the economic loss and the burden of carrying equipment to and from Nyankpala. Prevents solving Upper West problems using Northern or Easting regional conditions. Location has electricity and water.	
Substations	Babile	• Located in Guinea and Sudan Savanna zones with the latter increasing as one moves eastwards. • Excellent area for crops-livestock integration research. • Area is noted for poultry and small ruminants breeding and production as a major source of livelihood. Considered as a HUB for joint crops-livestock research for the improvement of livestock. • Area has a peculiar farming system of both compound and Bush farms with sorghum and millet as major crops. Livestock are tied to ropes during feeding to discourage crop destruction. Donkeys are used for ploughing and haulage. • Noted for peculiar agro-climatic conditions- low rainfall, degraded soils • Abundant land for research.	• Vandalized buildings/offices that need rehabilitation • Abandoned structures for research trials and ruminant breeding and production
	Jirapa	• No building • Guinea savanna zone gravitating towards Sudan Savanna vegetation . Site will cut down cost and inconvenience of having research trials carried out in between Tumu and Babile.	• No infrastructure
	Tumu	• Guinea savanna zone gravitating towards the Sudan savanna zone. Extensive soil degradation. Potential for carrying out integrated soil management trials.	• One habitable staff quarters. Land for research is available
Region: Upper East	Manga	• Represents the HUB of the Upper East region. A typical Sudan zone with a small guinea savanna zone. Different socio-economic circumstances. Pearl Millet is a peculiar crop in this area. • On national electricity grid. Has broken down mechanized borehole. Strong winds	• Habitable buildings/offices that need rehabilitation • Equipment that needs minor repairs.

	LOCATION	PECULIAR CHARACTERISTICS	INFRASTRUCTURE/ EQUIPMENT STATUS
		useful for windmill irrigation. • High population density. High land pressure	